ELECTRICAL REVIEW

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Avoiding Waste

Applications of Quality Control Methods

WHERE articles of the same type are produced in quantity there is an obvious advantage in ascertaining immediately whether variations from standard fall outside the permitted margin of tolerance. Any tendency to do so gives timely warning that all is not well with the manufacturing process. This, simply, is the function of the statistical method of quality control during manufacture. It comprises the measurement at regular intervals of relatively small samples, the plotting of the results of these measurements on charts, which are in constant view of inspecting and production staffs, and the fixing of control limits by statistical method irrespective of the specification limits.

Institutions' Interest

As an important aid to production for war purposes, quality control is now employed in most of the Royal Ordnance Factories and is a normal feature at Government training centres. A great impetus was given to its extended use by the launching of a campaign by the three major engineering Institutions last April, when Sir Frank Gill gave a lucid exposition of the practical aspects (see *I.E.E. Journal* for July, 1942). Incidentally, the basic principles of the interpretation of statistical data formed the theme of Mr. W. Fordham Cooper's address as chairman of the I.E.E. North Midland Centre last October.

Quality control is not new, as its merits have been proved in the cotton and chemical industries over a number of years. In the early 'twenties the statistical method was applied by Dr. B. P. Dudding to lamp manufacture and the subsequently issued B.S.S. 161 based the interpretation of lamp performance entirely on statistical data and not on the behaviour of individual lamps. Only recently has the method been applied to production engineering, and last week we included an article on the present position by Mr. H. Rissik, who pioneered this development towards the end of 1940.

Ease of Introduction

There need be little difficulty in introducing quality control into a works. From his experience of its working on a large scale, Lieut.-Col. L. E. Simon of the United States Ordnance Department holds that the technique should initially be applied to a few selected operations under skilled supervision, at first in association with ordinary engineering control, and extended as personnel is trained to understand the system.

The greatest individual contribution to the progress of quality control Col. Simon considers to be the preparation of a Defence Emergency Standard giving simple instructions for the setting up and operation of a works system. For its purpose the document could hardly be bettered, and the British Standards Institution has done well to issue it in this country as B.S. 1008.

Although quality control has come to the fore under the stress of war, there can

be little doubt that it will remain in appropriate circumstances, and these are perhaps much more common than has hitherto been generally appreciated. While the primary function of the technique is to minimise the amount of spoiled products with the accompanying waste of labour and, sometimes, testing to destruction, certain of its implications deserve further thought. There is, for instance, Sir Charles Darwin's suggestion (*loc. cit.*) that, since the statistical method enables reasoned instead of guessed values to be assigned to tolerances, the latter should be decided by discussion between users and makers of production machinery—a procedure that may materially affect the design of plant for quantity production.

Coal Sampling

PROXIMATE analysis has its limitations when used to determine the *prima facie* suitability of a type of coal for a specific purpose. One limitation is due to the type of laboratory equipment available, which is often far from complete; the other is due to the sometimes inadequate experience of the testing staff. In the paper which they presented before the Institute of Fuel, Messrs. J. Brown and A. A. Bean emphasised the need for a series of analyses for any given coal. Where these are carried out on a big enough scale, there would seem to be scope for the statistical method of approach to the subject.

Special Pleading

THE statement recently made by a joint committee of women's organisations that existing electricity charges are too high for the ordinary household to use electricity for domestic purposes is a sweeping generalisation with but a grain of truth in it. Undoubtedly there are still many districts in which the use of electricity for anything more than lighting is an impossibility for most people, but this is certainly not true of the majority of towns or of a large number of villages, Undertakings in our large towns supply a considerable part of their output to people in the low-wage earning classes who find it as cheap in the long run as any other agent for domestic use. The view seems to be held that electricity could be supplied for next to nothing by a nationalised service and from the fact that the committee represents co-operative, labour and trade union organisations this might have been expected.

E.P.T. Anomaly

SIR GEORGE NELSON, in his speech at the English Electric Co.'s meeting last week, was able to claim that attention had been given to the subject of the allocation of the 20 per cent. of Excess Profits Tax payment which is to be refunded after the war. But he still had to point out the adverse effect of the tax upon companies with a poor standard profit. These concerns were quite unable to make the necessary provisions for meeting post-war conditions, though they had made great war-production efforts, and they would therefore be involved in great expense in re-adapting their works to peacetime needs. Other concerns may be doing less towards winning the war and yet by reason of a good profit standard may be able to provide more adequately for post-war reconstruction.

Cable Overloads

BELTED cables of from 0·2 to 0·275 sq. in. have been run up to 150 deg. C. emergency on a 24-kV system by the Detroit Edison Co. without failures when the cables were initially sound. The gain in emergency rating was, however, considered to be incommensurate with so great an increase in temperature (*cf.* the 85 deg. taken as the upper limit in Great Britain) and the company has adopted an emergency standard of 95 deg. C. for overloads not likely to occur more than once a year. This gives a maximum loading for the larger cable of 425 A on a three-hour peak and 375 A on a fifteen-hour peak.

In Switzerland Too

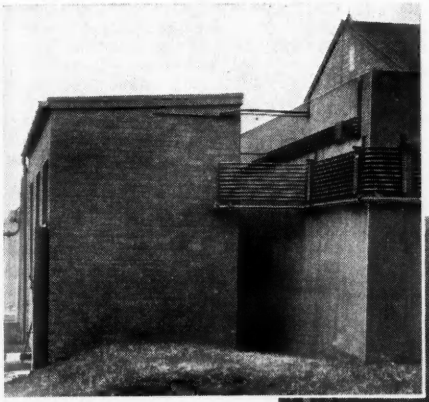
COMPETITION between electricity supply undertakings and retailers has often caused trouble in this country in the past, but it seems that we do not stand alone in this matter. According to the *Ironmonger*, Davos members of the Swiss Ironmongers' Association have complained that a local supply undertaking has been selling aluminium cooking utensils at cost price plus a mere 10 per cent. for carriage and packing. It is thus underselling the ironmongers and the matter has been taken up with the Federal Price Control Office with a view to the fixing of a *minimum* retail price.

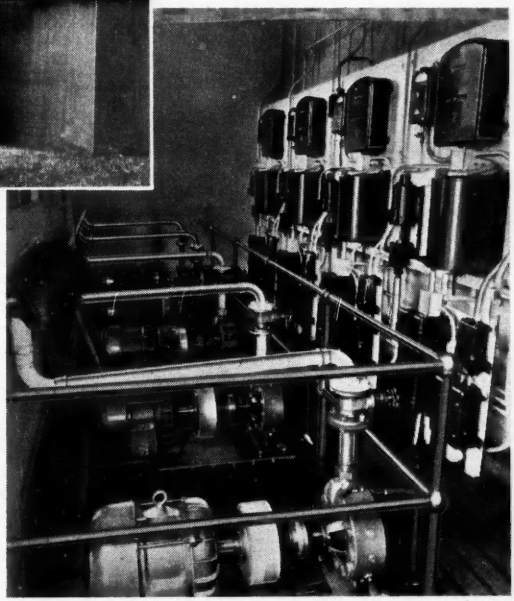
A Unique Installation

Special Features Pertaining to Explosives Factory Conditions

UNDER present conditions the type of factory installation for which the normal electrical regulations are inadequate is more frequently encountered, and readers may be interested in the following description of an installation of this kind which we recently had the opportunity of inspecting during a factory visit.

The factory in question handles explosives varying from those of a highly sensitive nature, such as fulminate of mercury and lead azide, to those of the stable variety, such as T.N.T., and owing to the differences in the nature of these materials the plant and the manufacturing methods employed vary very considerably in different sections of the factory, with a consequent effect upon the use of electricity and the electrical installation.



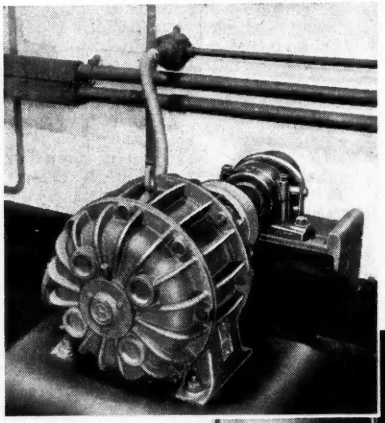


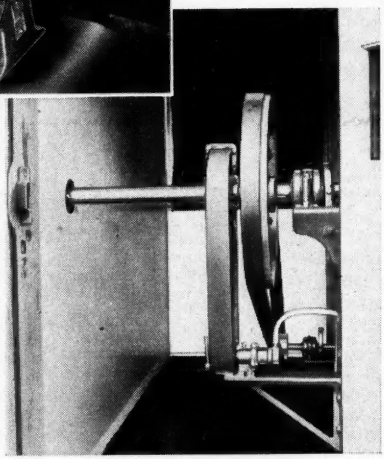
Above: The motor houses are sometimes entirely separate structures near the process shops. Right: The pumps are installed with their driving motors and control gear complete in the isolated motor house

Electricity is extensively applied throughout the whole plant for power and lighting and certain special purposes peculiar to the product and, in order to keep the working conditions safe, special precautions have been taken to protect both the electrical equipment and the process plant from the installation and working points of view. The first impression the visitor gets of these special precautions is the enormous amount of conduit wiring outside the buildings about the factory, for electrical wiring and switchgear are definitely prohibited in many of the buildings. Galvanised and painted screwed conduit is used for such external wiring, and the conduits are well spaced from one another and from the walls to which they are cleated. All the electric motors, either driving machines direct or through line shafting, are installed in separate brick-built motor houses and are thus isolated electrically from the explosives workshops, with the exception of flameproof remote controls.

The motor houses are sometimes entirely separate structures situated very near the process shops with which they are associated, and this arrangement is a particularly suitable one where the drive is not directly related to the process plant. For instance, where the plant requires servicing with a fluid the pumps are installed with their driving motors and control gear

complete in the motor houses, thus considerably simplifying the power transmission arrangements. The factory contains a very large number of small hydraulic pumping units which are directly motor driven. The same principle of isolation is adopted in the installation of these, and the typical pump house illustrated also shows the exterior wiring connecting up the motors and switchgear, as well as the gable end of the process building with which this pump house is associated. The actual pumping equipment inside is under semi-automatic control from the process plant in the adjacent building.





A good example of through-wall drives; a 24-HP motor with shafting extended through a wall gland. In some cases the principle of isolation is extended to housing the main transmission arrangements in an intermediate room (right)

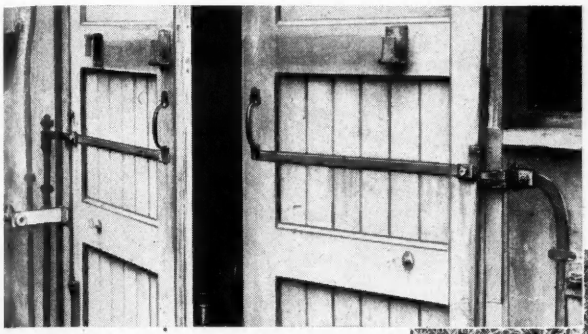
In other cases the motor houses directly abut the process buildings with which they are associated, and this arrangement is particularly suitable for shaft transmissions through the walls. In most cases the major transmission is effected in the process room on the other side of the wall. A typical instance is where, from the motor shaft end near the floor, there is belt reducing transmission up to a line shaft bracketed to the ceiling, and from this shaft there are secondary transmissions down to right angle gearboxes mounted on cylindrical structures through which the transmissions are continued to the process plant inside.

Photographs illustrating the scheme we have just outlined depict a good example of the principle of through-wall drive. Two 24-HP motors driving through a wall gland to the line shafting inside the process building are shown in one, while a section of the power transmission scheme actually inside the process building is shown in the other. In some instances, however, the working conditions are so severe that the principle of isolation is extended to housing the main transmission arrangements in an intermediate room between the motor house and the process room. In each instance, where the motor or line shafting leaves a motor house and enters an explosives shop it passes through a well-fitting wall gland which seals the hole in the wall, so that any possibility of the entry of explosive dust into the motor house is precluded. In many cases fully flameproof motors and control gear are used, while in other instances totally enclosed motors and flashproof control gear give sufficient safety, but the only electrical apparatus, apart from lighting fittings, allowed inside any shop containing explosives are flameproof type push-button stop and start controls for the distant operation of the corresponding driving motors.

In many shops, however, the lighting fittings are not allowed inside, and in some of these cases wall-recessed bulkhead fittings are the solution to the problem. Each fitting has on the outside, *i.e.*, at the back, an external connection box for the cable-entry arrangements and a detachable plate to permit access to the lamp. In another lighting scheme for similar conditions fittings outside bear against the glass frontage of the building and project their light in a horizontal plane to the process plant. These fittings are suspended by conduit "drops" from a main trunk conduit with a swivel joint at each tee connection, so that in the event of an explosion the lighting fitting swings outward under the released pressure and consequently is not seriously damaged.

Close attention has been given to protection against the possible effects of lightning and static electricity. Throughout the explosives

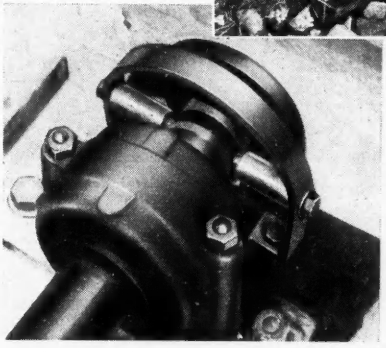
portions of the factory anti-static belting is used for all motor belt-transmission schemes. This belting is of a composite character and is mainly composed of rubber which has been impregnated with a specially prepared medium to give it reasonable electrical conducting properties. No metal belt fasteners are used. Some very interesting investigations are being made by the factory engineers, in conjunction with others interested, in the research on the subject of electrical conducting rubber, and already some notable results have been obtained which will have a considerable influence on installation work of the kind with which we are now dealing.



The base tapes are connected to an extensive external earthing system and the earthing system is brought out to test points (right). In some cases the tapes are connected to the doors (above), flexible copper braiding overcoming connection difficulties

All the factory buildings are served by an extensive system of internal and external copper base tapes to which all the machinery, including line shafting, is connected, and these base tapes are connected to an external earthing system consisting of copper tape carried to deep earthing points in various parts of the factory. The base tapes consist of $\frac{1}{8}$ in. by $\frac{3}{4}$ in. hard-drawn copper, and they are saddled to the walls, etc. The joints are riveted and sweated and special clamping plates are employed for multiple joints and test points. In some cases the tapes are even connected to the handles of the doors of dangerous buildings, and in such instances flexible copper braiding is used to overcome the connection difficulties owing to the door movements. The earthing system tapes are of similar size and the network is brought out in various places to test points which enable continuity of earth-resistance tests to be made quickly. The test points each consist of a shallow pit constructed of a metal box with a hinged door, like those used for below - ground water taps, into which the end of the testing tape projects from below ground.

Line shafting is earthed by means of spring - loaded carbon brushes in a similar manner to the normal slip-ring connection arrangement. The two brush housings in each case are bolted to a stout copper bar half encircling the shaft and this bar is bolted to the bearing housing or support which is, in turn, connected to the tape earthing system.



Line shafting is earthed by spring-loaded carbon brushes

In order to minimise the effect of static charges carried by operatives certain parts of the factory where sensitive explosives are dealt with are equipped with personnel conductivity testing stations at which the operatives have to test themselves before proceeding to the explosives buildings. This also gives a measure of the conductivity of the footwear they are using and is of considerable

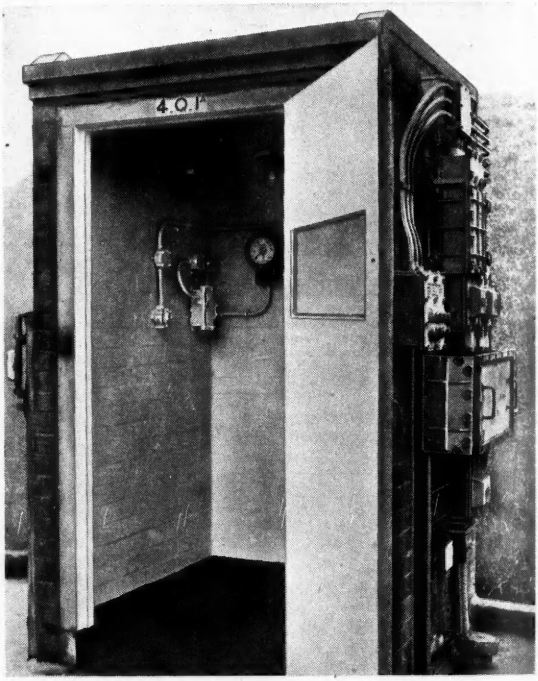
importance. The outfit at a typical station consists of a milliammeter, a battery and a fuse-switch, as well as a hand knob and footplate between which the man completes the series circuit when he tests himself. Also incorporated in the outfit is a known resistance and press switch by which the station equipment can be frequently checked.

Normal methods of lightning conducting protection are adopted, all the finials being interconnected on the respective roofs and carried down to the external base tapes to which all the metal parts of the building are bonded.

In certain cases it is not considered desirable for an operator to be inside the building in close proximity to the plant when this is started up, even though flameproof gear is used, and in such cases the electrical equipment is operated remotely from an outside building by means of mechanical controls consisting of rodding carried inside conduit with Hans Renold chains to transmit the motions round the various bends in the conduit runs. The motions of some of these remote mechanical control schemes are initiated by levers, and of others by hand wheels which impart the necessary motions to the rodding on the screw principle.

Certain parts of the factory are equipped with personnel conductivity testing stations

In other cases the whole operation is effected by means of remote electrical control from small control buildings situated at considerable distances from the explosives shops. These buildings not only contain the necessary switchgear, but also tachometers which indicate whether or not the motors are operating at the correct speeds, and signal bells by which operators in the shops give the necessary instructions to the operators in the control rooms. Some of the controls are mounted outside the remote control house, together with the distribution equipment, but the more important controls and the instruments are inside the building.



In some cases electrical control is effected from buildings at considerable distances from the explosives shops

New T.V.A. Dam

CONSTRUCTION of the Douglas Dam by the Tennessee Valley Authority, authorised by Congress thirteen months ago, has been completed in half the scheduled time. In a message read at the dedication ceremony last Monday, President Roosevelt said that it established a new record in engineering history.

Scottish Water Power

Bill Receives Second Reading

THE Government's Hydro-Electric Development (Scotland) Bill, the provisions of which were reviewed in the *Electrical Review* of January 29th, received an unopposed second reading in the House of Commons last week. It will now be examined by a Committee of the whole House.

Mr. T. Johnston, Secretary of State for Scotland, in explaining the scheme, said that the House would remember the withdrawal in 1941, in face of intense opposition, of the Bill empowering the Grampian Electricity Supply Co. to erect hydro-electric works at Glen Affric and Glen Cannich. The greater part of that opposition arose from a widespread objection to the further vesting of monopoly powers over great natural resources in the hands of a private company. Since 1929 six separate schemes to procure monopoly rights for private companies had been rejected, but it was clear that after the Glen Affric proposal was withdrawn the matter could not rest theret

In the Highlands there were eighteen authorised electricity undertakers, seven of them municipal and eleven private companies. There were still vast power resources, a great commercial asset for the Highlands, estimated provisionally at 4,000,000,000 kWh a year or 450,000 kW continuous power, not being utilised. Industries which might have been situated in the Highlands had been developed in other lands and there were counties—Caithness, Sutherland, and Shetland—where one-third of the population had disappeared in the last sixty years.

Functions of New Board

The present Bill provided that the further development of the water power resources in the North of Scotland should be carried out by a non-profit earning Public Services Board, that outside the area of existing undertakers the new board should be the distributor of electricity, and would give priority of supply to ordinary consumers and also to existing undertakers on demand. It would have the right to acquire existing undertakings in the North Highland area by voluntary agreement, and the powers of the Central Electricity Board in so far as they applied to the North of Scotland would be transferred to the new Board. He had good reason for hoping that the Scottish Co-operative Wholesale Society would plant industries in the Highlands when electrical power was available. Other concerns had expressed similar intentions.

The Cooper Committee (see *Electrical Review*, December 25, 1942) had declared that large scale industries of the electro-chemical and metallurgical type would only be attracted to this country by cheap hydro-power.

Dealing with finance, Mr. Johnston explained that the new Board might borrow on its own credit without limit. But power was given to the Treasury to guarantee the loans of the board up to a total of £30,000,000. That figure should not be regarded as a forecast of the capital cost of the board's schemes—still less did it mean that the board was committed to that expenditure.

Like the Central Electricity Board, the North of Scotland Board was intended to pay its way, and the Treasury guarantee would only be applied for if it proved to be necessary in order to make the scheme pay as a commercial concern.

So far as amenities were concerned, the chief amenity he would like to see carried into the life of the North of Scotland was the amenity of economic security, the right to work, and the amenity which derived from remuneration for a useful service in the world. The Bill provided some contribution to that end. But there need be and ought to be no disfigurement or desecration of the beautiful scenery either by the hydro works or by industries which it was hoped would be attracted to the Highlands. It was proposed to set up an advisory committee on amenity and another on fisheries and the Board would be required to consult both in preparing constructional schemes. As planning minister, the Secretary of State would be able to exercise considerable influence upon the layout of any new industrial plans and housing attracted by the electrical schemes.

Rating Anomaly

The Cooper Committee estimated that the amount of local rates payable in respect of a hydro-electric undertaking was approximately three times the amount payable by a steam undertaking with a comparable output of electricity. A radical alteration in the basis of valuation of hydro-electric undertakings clearly required very careful examination owing to its possible repercussions upon the rating of other subjects. While, therefore, he was prepared to accept the recommendation of the Committee that the matter should be examined on its merits, he did not think it desirable to delay the introduction of the present Bill until this necessarily complicated examination about local rating could take place. He proposed, however, to set up forthwith a committee of inquiry to examine this and certain other rating and valuation problems

Schemes promoted by the new Board might have repercussions upon other Highland and national interests quite outside hydro- electricity. Their operations might affect the location of industry, some branches of afforestation, such as saw-milling, agriculture and agricultural processing, the electrification of railways, and the tourist industry. It was, therefore, necessary in the Scottish national and public interest that the activities of the new board whether in the development survey stage, the construction scheme stage, or the distribution scheme stage, should always be subject to a Minister who was answerable to Parliament. He would also regard it as unfortunate if the new board were not to have the guidance of the Electricity Commissioners.

The scheme would give considerable employment, direct and indirect, in coal, iron, steel, cable-making, electrical engineering, cement,

house and civil building works, and contracting. On the basis of the experience of the Central Electricity Board the operations of the Scottish Board on an expenditure of £30,000,000 should give employment direct and indirect of the order of 10,000 men for a number of years. In its train the Bill would bring a better placing and location of industry. It would provide amenities for the Highland population which would be otherwise denied them.

In the debate which followed Mr. Pethick-Lawrence urged that every step compatible with efficiency should be taken to safeguard the amenities of the Highlands.

Mr. Wedderburn pointed out that it might be that the loss of the Glen Affric measure, which might have made us independent of Norway for our carbide supplies, had been a serious impediment to our war production. It was hopeless to try to promote the proper use of water-power in the Highlands through a succession of private Bills, all of which raised a storm of discord. The Bill commanded the assent of nearly every responsible body and section of opinion in Scotland.

Commander Galbraith said that the only hope of getting electricity introduced into the Highlands was to pass a measure of this kind. Major Neven-Spence deplored the blow struck at private enterprise, though he thought the Bill necessary. He declared that the Grampian Company had done its work most successfully.

The rejection of the Bill was moved, in the following terms, by Mr. Henderson Stewart:—"That this House, recognising the vital part to be played by hydro-electric power in the regeneration of the Highlands and the development of Scottish life and industry, which it regards as a major object of national policy, welcomes the proposal to establish a public service corporation in the North of Scotland for the generation and distribution of electricity from water power; but declines to give a second reading to a Bill which so circumscribes the powers and duties of the corporation by bureaucratic controls and needless references to Parliament on details of its work that it robs the corporation of freedom and initiative in the conception and prosecution of the undertaking (for the financial solvency of which it will be responsible) and will cause repeated delays in the performance of its task and unjustifiable postponement of the betterment of Scottish conditions."

He said that the more public utility concerns were free from Whitehall the more successful they were. Scarcely a day would pass without this board having to seek the consent of some Department in London for the ordinary purposes of carrying on its business. The Secretary of State had apparently consulted the local authorities, but not one of the expert bodies connected with the electricity industry had been approached.

Mr. J. S. C. Reid (Lord Advocate) said that the reason the Bill was drafted in its present form was that a public board could not be left responsible to nobody, more especially if there was money guaranteed by the Treasury. That responsibility must ultimately rest with Parliament. The only way to make the Board directly responsible to the House would be to place it under a Government Department and that the Government was determined not to do. In the present Bill they believed they had achieved the middle line.

The motion for rejection was withdrawn and the Bill was read a second time.

Forthcoming Events

Institution of Electrical Engineers.—*Transmission Section.*—Wednesday, March 10th, 12.30 for 1 p.m. Informal luncheon at Connaught Rooms, W.C.2. 5.30 p.m. (at I.E.E.). Paper: "The Ventilation of Substations," by Messrs. F. Favell and E. W. Connon.

Installations Section.—Thursday, March 11th, 5.30 p.m. Papers on "The Future of the Domestic Wiring Installation." "Section 1. Immediate Developments," by Messrs. W. J. H. Wood and Forbes Jackson. "Section 2. The Distant View," by Messrs. G. Smith and E. Jacobi.

Wireless Section.—Tuesday, March 16th, 5.30 p.m. Informal discussion on "Factory Testing of Radio Equipment," to be opened by Mr. F. L. Hogg.

Western Centre.—Monday, March 8th. at Bristol. Paper on tariffs by Mr. C. T. Melling.

North-Eastern Centre.—Monday, March 8th, 6.15 p.m. Neville Hall, Newcastle-on-Tyne. Papers on tariffs by Messrs. P. Schiller and C. T. Melling.

Scottish Centre.—Tuesday, March 9th, 8.15 p.m. Societies' Room, Royal Technical College, George Street, Glasgow, C.1. Informal paper on "A Recent Ultra-Short-Wave Radio Installation," by Mr. F. E. Bland. (Joint meeting with Post Office Engineers.) Tea 5 p.m. at Daniel Brown's, 79, St. Vincent Street.

North-Western Centre Wireless Group.—Friday, March 12th, 6 p.m. Engineers' Club, Albert Square, Manchester. Informal opening meeting. Discussion on "Quartz Crystal Applications," to be opened by Capt. C. F. Booth.

North-Western Students' Section.—Saturday, March 13th, 2.30 p.m. Engineers' Club, Manchester. Paper: "Electrical Equipment in Aircraft," by Mr. L. A. Crumblehulme.

North Midland Centre.—Saturday, March 13th, 2.30 p.m. Great Northern Hotel, Leeds. Paper: "Busbar Protection," by Messrs. M. Kaufmann and W. Szwander. *Students' Section.*—Saturday, March 6th, 2.30 p.m. Griffin Hotel, Leeds. Problems afternoon.

Royal Society of Arts.—Mondays, March 15th, 22nd, 29th and April 5th, 1.45 p.m. Cantor Lectures on "The Modern Power Station." The first lecture on "The Boiler House" is to be given by Mr. C. H. Sparks (Babcock & Wilcox, Ltd.).

Association of Mining, Electrical and Mechanical Engineers.—*London Branch*—Thursday, March 11th, 4.30 p.m. Junior Institute of Engineers, 39, Victoria Street, S.W.1. Paper: "Mine Shaft Signalling," by Mr. H. J. Hadlow.

Association of Supervising Electrical Engineers.—Tuesday, March 16th, 6.15 p.m. Lighting Service Bureau, 2, Savoy Hill, W.C.2. Lecture on "Industry and Education," by Dr. P. Dunsheath, O.B.E.

Electro-Biology

Recording E.M.F.s of Living Cells

ONE of the fundamental properties of living cells is the production of electromotive forces. Not only are differences of potential inseparable from the elaborate chemical reactions which constantly occur in vital processes, but many essential functions of living tissue are mediated by the small currents which the cells generate, usually preceding (in time) such more obvious signs of life as muscular action, nervous conduction and glandular secretion.

The basic phenomenon underlying this electrical activity is the maintenance of the interior of every living cell at a steady potential difference of about 50 μV negative with respect to its "outside." For instance, there is a similar difference between injured and intact surfaces of nerves and muscle, since injury exposes the inside of the cell by breaking down the cell wall. Such "injury-potential" exists in all living cells, plant and animal, though its magnitude varies with different kinds of cell as does also the capacity of the cell to maintain it.

"Action Currents."

When a cell is stimulated to activity changes occur in its wall which in most cases result in the active region becoming negative to the inactive area, so causing "action current" to flow. In tissue that is specialised for the conduction of impulses (nerve, muscle, and certain kinds of plants) the region of activity travels down the conductor away from the point of origin and can be detected as a moving patch of "negativity," these travelling impulses being usually ascribed to the breakdown of polarised membrane enclosing the nerve, resulting in migration of ions to the injured region from the part immediately above it. Restoration of the injured surface leaves the portion of nerve ahead depolarised, which is restored in its turn, thus propagating the impulse throughout the length of the nerve. The newly restored nerve surface is temporarily refractory, rendering it insensitive to a second stimulus until a definite interval of time has elapsed.

Voltages involved in these biological reactions can be amplified and recorded in various ways, which are reviewed in a paper prepared for the Wireless Section of the Institution of Electrical Engineers by Messrs. G. Parr (editor of *Electronic Engineering*) and W. Grey Walter (physiologist, Burden Neurological Institute, Bristol). With the aid of circuit diagrams they compare input circuits appropriate to thermionic valve amplifiers of several kinds that have been used for bio-electrical frequencies of from 1 to 10,000 c/s. In comparing mirror, cathode-ray and pen-writing recorders they show that no single type is entirely satisfactory over the whole range of potentials and frequencies encountered; choice of instrument is determined by the special character of each research.

The paper has been written with special reference to the electrical activity of the human brain, in which differences of potential varying between 5 and 1,000 μV are produced; the wave form is alternating, being irregular and of very low frequency. The authors explain how the previously described methods of recording are applied for obtaining electro-encephalograms of the potentials developed in the human cerebral cortex.

Diagnosis of Diseases

The frequency of the output from an abnormal brain (epileptic and cerebral tumour cases) differs appreciably from the normal state; from this and other indications it is possible to diagnose mental diseases and also to locate with considerable accuracy the site of a tumour by systematic exploration of the skull to find the voltage focus of very low-frequency (less than 8 c/s) rhythm that is characteristic of abnormalities of the brain.

One of the authors has recently developed apparatus for analysing waves of low frequency (1 to 20 c/s) on the mechanical resonance principle, while further work on simplifying means of automatically examining encephalograms is in progress and it is hoped that a report thereon may be added as an appendix to the paper before it appears in the *I.E.E. Journal*.

X-Ray Analysis

A SECOND conference on the analysis of substances and the examination of their behaviour by X-ray diffraction methods has been arranged by the Institute of Physics to take place in Cambridge on April 9th and 10th next. The provisional programme includes a lecture on "Future Developments in X-ray Crystallography" by Prof. J. D. Bernal, and discussions on "Quantitative Treatment of Powder Photographs," "The Fine Structure of X-ray Diffraction" and "Fine Broadening." A report is to be presented to the conference on the progress made in the preparation of an index to X-ray diffraction photographs, for which the Institute has undertaken to be jointly responsible with the American Society for Testing Materials and the American Society for X-ray and Electron Diffraction. Further particulars of the conference and of the index can be obtained from the secretary of the Institute of Physics at the University, Reading.

Red Cross Appeal

Third List of Subscriptions

WE have received from the joint secretaries of the Electrical Industries Red Cross Fund a further list (the third) of covenanted subscriptions and donations resulting from the appeal made by the late Lord Hirst, in January. The previous lists were published in the *Electrical Review* of February 5th and 19th.

The list again includes the names of large and small concerns and shows that all sections of the electrical industries are doing their share in making the Fund a success. We hope to publish further representative lists.

We may repeat that subscriptions and donations should be sent to the Electrical Industries Red Cross Fund, St. James's Palace, S.W.1, and that correspondence should be addressed to the joint secretaries at 2, Savoy Hill, W.C.2.

Covenanted Subscriptions (gross)

	£	s.	d.
Brought forward ..	5,813	8	0
Automatic Telephone & Electric Co., Ltd.	400	0	0
North Somerset Elec. Supply Co.	100	0	0
St. Helen's Cable & Rubber Co., Ltd.	100	0	0
Oliver Pell Control, Ltd.	50	0	0
G. S. Peckham & Co., Ltd. ..	40	0	0
Mid-Lincs Electricity Supply Co.	20	0	0
J. H. Tucker & Co., Ltd.	10	10	0
Reynolds & Bradwell, Birmingham	10	0	0
J. E. Dallas & Sons, St. Mary Cray	6	6	0
Frank A. Meggitt, Mansfield ..	4	4	0
R. P. Ratcliff, Sheffield	4	0	0
The Rapid Co., Glasgow.. ..	2	2	0
Henry Featherstone, Tunbridge Wells	2	0	0
	£6,562	10	0

Donations

	£	s.	d.
Brought forward ..	3,293	15	3
Ericsson Telephones, Ltd. ..	250	0	0
Bakelite, Ltd.	105	0	0
Borough Treasurer, Leigh, Lancs.	50	0	0
West of England Electric Investments, Ltd.	50	0	0
Mold Urban District Council ..	10	10	0
British Institute of Engineering Technology	5	5	0
Eburite Corrugated Containers ..	5	5	0
G. Gasperson, Ltd., Leeds ..	5	5	0
Bennett & Fountain, Ltd., London, W.1	2	2	0
Ripaults, Ltd.	2	2	0
Aerialite, Ltd.	1	1	0
Wandleside Cable Works, Ltd., Wandsworth	1	1	0
	£3,781	6	3

Electroplating Non-Conductors

Methods of Applying Graphite Films

AS a possible method of conserving metals the electroplating of such non conducting materials as plastics, wood, cardboard, insulating paints and varnishes and hard rubber has attracted some interest recently. Furthermore, a plated dielectric may in some circumstances be more suitable than a solid metallic piece, for it may happen that the electrical or physical characteristics of metal are only required at the surface of the object in question. There are also advantages in being able to combine the lightness and strength of a plastic with the properties of a metal with reduced density.

In electroplating on a graphite film certain difficulties have arisen which E. G. Acheson, Ltd., have approached in two ways. First, there is the production of a graphite film of maximum electrical conductivity and, secondly, there is the treatment of that film to render it as resistant to water as is possible in practice. The maximum conductivity of a graphite film depends to a large extent on the basal orientation of the flat graphite particles which compose the coating. Thus, if the colloidal dispersion of graphite is applied to a relatively rough or porous material, the particles will not orientate effectively for contact between one particle and another. This has been largely surmounted by applying a material to the rough or porous surface which produces a smooth exterior. There are several ways of accomplishing this, one of which is the use of a mixture of potassium dichromate and gelatine in solution. When this film has hardened, the gelatine being rendered water-insoluble in the presence of potassium dichromate and by the action of light, a dispersion of colloidal graphite is applied to the smooth surface which results from this treatment.

By control of the size of graphite particles, different ranges of conductivity in the graphite coating can be obtained. If the latter is quite dry it may be burnished to improve the conductivity and a value of the order of from 20 to 30 ohms per square inch can be obtained under ideal conditions.

The use of a thin film of wax on top of the graphite will be sufficient to make the latter waterproof without appreciably affecting the conductivity normal to the surface. This means that electroplating can be applied to a graphite film without the liquid seeping into the film.

Plating by this new means has been successfully carried out and the technique can be varied to suit local conditions. Thus, copper, nickel and other metals have been deposited on wood, plastics and cardboard.

Low-Voltage Joints

Eliminating Lead Sleeves

By H. W. Breeze, A.M.I.E.E.

IT has become necessary in the national interest to conserve lead and tin, and some engineers who have in the past used lead sleeves and lead boxes for low-voltage work are being obliged to dispense with them. There is little technical justification for the use of lead sleeves, as cast-iron straight-through joint boxes and service boxes, correctly designed, have shown their efficiency over a number of years. Literally hundreds of thousands of service boxes of this type are in use in this country and abroad, and they have proved thoroughly reliable.

The essential requirements in a box of this description may be summarised as follows :— 1. Ample jointing space ; 2. Liberal compound filling holes ; 3, Compound expansion space ; 4. Efficient bonding; 5. Watertight construction.

1. As service boxes are generally jointed on " live " cable, the joint must not be cramped. Adequate electrical clearances must be ensured. Unless the space is adequate air pockets in the compound may result, as the compound could not flow freely between the cores.

2. To ensure rapid compound filling and so drive out air and moisture, liberal compound-filling holes are necessary so that the compound can be poured direct from the bucket.

3. Compound space is necessary to ensure that when the compound settles down it is well above the conductors. Provision of this space also prevents the possibility of compound being driven out of the box due to expansion and, subsequently, on contraction, drawing in moisture and air.

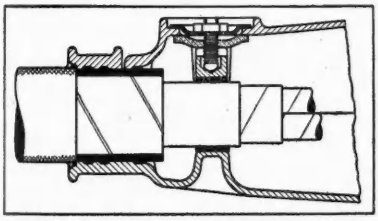


Fig. 1.—Arrangement of shuttle bond

4. One of the best methods evolved for bonding the lead of the cable is the shuttle bond, which is located just inside the compound gland, a typical arrangement being shown in fig. 1. A stop is provided to ensure that too much pressure cannot be applied to the lead sheathing and so damage the cable. Where the cable is smaller than the bond a few layers of lead tape are wrapped round the cable so that it fits the bond. Where armoured cable is used, the plummer-block type of armour clamp has proved its efficiency. Another type of bond is a tinned copper strip soldered to the lead of the cable and secured to the bottom of the box by a screw.

The efficiency of these two types of bonding is about equal. A few years ago some interesting tests were undertaken by the Henley Research Laboratories to ascertain the efficiency of the bond under vibration and under heat cycles.

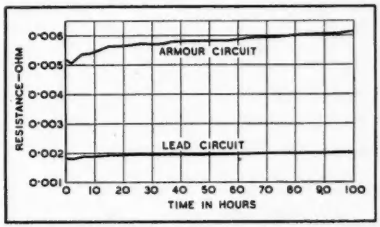


Fig. 2.—Deterioration of bond resistance due to mechanical vibration

Boxes are sometimes installed in situations where they are subject to vibration or subsidence, such as on sites adjacent to railways or on routes subject to heavy traffic. The resistances of the lead circuit and armour circuit of the shuttle bond were practically constant when measured on a box subjected to a frequency of vibration of 570 per min. The total amplitude measured at the centre of the box was $\frac{1}{8}$ in. After 100 hours' vibration the increase in the resistance of the lead circuit was 8·1 per cent. while that of the armour increased by 17·4 per cent. (see fig. 2).

A service box was jointed with a length of low-voltage cable and filled with compound in the usual way. The resistance of one bond was determined when the box had cooled after compound filling to a temperature of 18 deg. C. After 250 A. had been passed through the cable conductor for a period sufficient to raise the bond temperature to 40 deg. C. (as measured by a thermo-couple situated close to the bond), the resistance was again determined. This process was repeated every day for twenty days. Fig. 3 shows that

the value of resistance decreases and the bond improves with the application of heat cycles, reaching an asymptote after approximately twenty days.

5. To obtain a satisfactory watertight construction a good adhesion of compound to the box and to the sheath of the cable is necessary. Heating the box prior to filling assists this. One of the main claims of a lead sleeve and lead box is that it can be plumbed on to the lead of the cable and thus render it watertight. The same results have been obtained with a box having a gland provided with a compound pocket filled with hard-setting waterproof compound.

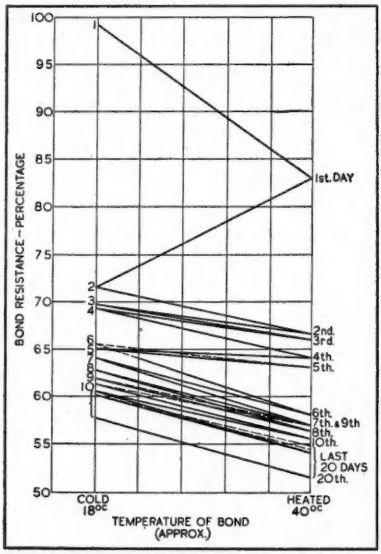


Fig. 3.—Variation of bond resistance with heat cycles

In a test carried out on a box filled with bituminous compound and immersed in a bath of tap water, the cores of the cable were connected to a 500-V DC supply, the earthed neutral of which was connected to the box. The test continued for nearly a year, the insulation resistance between the cores and between the cores and earth being measured at intervals. Apart from variations due to temperature changes, the dielectric resistance remained substantially constant, clearly indicating that no water had penetrated into the box.

Provided adequate clearances are obtained, cast-iron boxes without lead sleeves can be used for voltages up to 3·3 kV and for voltages up to 11 kV, provided special attention is given to the insulation of the joint and appropriate clearances are allowed in the box.

Post-war Houses

Women Demand Electrical Service

THE Standing Joint Committee of Working Women's Organisations, which represents organised Co-operative, Trade Union and Labour women, has sent a statement of its views on the planning of post-war houses to the Ministry of Health Committee on Design of Dwellings. In a recent inquiry by the Joint Committee, approximately 3,000 women, all over England, replied to a questionnaire and, in addition, conferences of working women were held throughout the country.

The demand for electricity for domestic purposes from every area is stressed as being one that must be met in post-war planning. Women in the country as well as town are almost unanimous in wanting electricity. " Mr. Therm," the report says, " has fewer and fewer friends." In villages and rural areas where there is as yet neither electricity nor gas, women want to by-pass the gas stage and go straight to electricity.

"Charges Too High"

The Committee believes that it is imperative that plans should be made to provide an electricity supply for the whole country, as a public service, not on a private profit-making basis. This, it is claimed, would make it possible to bring the price within the reach of everyone. It is a bitter complaint that existing charges are too high for the ordinary household to use electricity for domestic purposes.

The demand for labour-saving homes is universal, and the " tooling " of the kitchen is worthy of as careful attention as is given to the design and arrangement of machines in a modern factory. Mass production and standardisation are the answer to the housewife's demands for labour-saving equipment of a kind that has hitherto been available only for the well-to-do.

There should be electrical points in every room. For cleaning, radio, fires, etc., electricity is the first choice for cooking and also in many urban areas for water heating. Where other methods of water heating are preferred electricity is second choice. For both room heating and water heating the method in use in some countries of carrying water and steam by insulated underground pipes to houses from a central generating system is thought worthy of careful consideration.

Heating Methods

The popularity of the coal fire for the main living room is evident in every area. The largest minority which favours other methods is in the London area (10 per cent. electricity, 1 per cent. gas), and in other areas there are minorities from 5 to 9 per cent. Electricity is preferred to gas by the minority who do not want coal fires. Those who want coal fires would like a point for an electric fire in the living room as well. Opinion is divided between coal and electric fires for the second living room, gas fires being a long way behind in popularity. For bedrooms the majority of women in every area—varying from 83 per cent. in the North and in rural areas to 95 per cent. in London want electricity for heating (unless there is central heating). Built-in panel fires are generally suggested.

Analysis of Coal

Classification and Selection

USES and abuses of the results of testing large numbers of samples of fuels are discussed by Messrs. Joseph Brown and Alan S. Bean in a critical paper presented to the Institute of Fuel.

The authors commence with a statement that the curious expression " proximate analysis " has a unique meaning, its thorough comprehension requiring much contemplation and experience of its use. It is not an abbreviation of " approximate " and cannot indicate exact composition, revealing only things that may be found after the coal has been destroyed by heating or burning. Volatile matter is the king pin of proximate analysis, since it is the most difficult to standardise and also incorporates the errors of moisture determination. The temperature to which the testing crucible is heated is the most prominent cause of disagreement because even now laboratory workers do not use pyrometers to control temperature.

Superiority of Electric Heating

Incidentally the authors' long experience of muffle testing furnaces has convinced them of the superiority of electric heating for this purpose. Wound nichrome elements are very pleasant to use and quite reliable if not required to operate regularly much in excess of 900 deg. C., above which temperature their reliability may suffer and fairly frequent renewals may become necessary. For higher temperature requirements there may be some reversion to flame heating although it is the authors' conviction that in other spheres of laboratory work electricity, by virtue of its exquisite accuracy of control, will certainly take a great deal of dislodging.

Highly condensed treatment of the classification of coal presents a broad picture of the variety of types and indicates how proximate analysis can, almost unaided, place a coal in its correct category whether it be geological, chemical or in utilisation. But the authors are cautious in their attempt to ascertain how far one may go in predicting the industrial performance of a coal from its proximate analysis, because so much will depend upon the frequency with which the analyses are made.

The authors have not written about anything that is not well known and have brought forward scarcely anything that is new. Their treatment of the subject is not claimed to be more than an outline, but they have endeavoured to cover as much ground as possible in the hope of provoking discussion, since they believe that only by exchange of views can true progress be achieved.

B†

Gas-filled Cables

Design and Cost

IN order to cater for increasing loads, a 33-kV primary distribution system consisting of three-core solid cable had to be reinforced with gas-filled cable in the manner described by Mr. B. Calvert in a paper which he has prepared for the London Students' Section of the Institution of Electrical Engineers.

Physical and electrical details of the cable are tabulated, together with a cost comparison (three years ago) of several types and sizes of oil-filled and gas-filled cables. The basis on which gas-filled cable is designed is outlined, methods of detecting leakage of gas are discussed, and the method of laying direct in the ground in drum lengths of 240 yards is described. A departure from normal practice is the provision of tubes to carry the gas past the joints.

The gas-filled cables have given satisfactory service since January 1940, there having been only four small gas leaks without any electrical faults. Comparing gas-filled with solid cable, the author points out that although the former has a larger conductor it is lighter, the joints are smaller and the current-carrying capacity is greater than of solid cable of the same size, but gas charging apparatus has to be provided and, in addition, there is always the possibility of gas leakage.

Electronic Devices

OVER one hundred and thirty members and visitors attended this month's meeting o the London Section of the British Institution of Radio Engineers when Mr. J. H. Reyner dealt with some applications of electronic devices to industry. Diagrams indicated the types of circuits employed and methods were described of obtaining very high degrees o stability in electronic frequency generators which are often used as tuning devices in conjunction with cathode-ray tubes, or neon lamps employed stroboscopically.

Institute of Metals

AT the annual meeting of the Institute o Metals on March 3rd it was announced that Lieut.-Col.Sir John Greenly had been elected to serve a further term of office as president, the vice-presidents for 1943-44 being Dr. N. Cook, Col. P. G. J. Gueterbock and Mr. A. J. Murphy. The Institute Platinum Medal (a gift of the Mond Nickel Co., Ltd.) was presented to Dr. H. Moore, Director of the British Non-Ferrous Metals Research Association, who then read a paper on " Co-operative Research in the Metal Industries." The meeting was followed by a lecture by Dr. S. W. Smith commemorating the birth on March 3rd, 1843, of the distinguished metallurgist, Sir William Chandler Roberts-Austen.

Air-blast Switches

Comparison with Oil Circuit-Breakers

SOME of the more notable improvements in the design of circuit-breakers of large power, particularly those intended to reduce the quantity of oil needed for interrupting the arc, are discussed in a paper prepared by Mr. A. R. Blandford (English Electric Co., Ltd.) for the Institution of Electrical Engineers. The principal characteristics of air-blast breakers are reviewed while oil-filled and oil-less types are compared. The recent American development known as cross-blast is referred to, but the paper is chiefly concerned with the earlier axial-blast design of the Brown Boveri Co., Ltd., of Switzerland and the A.E.G. of Germany, both pioneers and both having installations of this class of gear in service in this country to-day.

Switching conditions affecting the rate of rise and the magnitude of recovery voltage are discussed, cathode-ray oscillograms being included to verify how these factors are affected by the use of resistors connected in parallel with the arc. Typical indoor arrangements of air-blast breakers rated at 500 MVA at 11 kV and 1,500 MVA at 66 kV are described with the aid of diagrams, illustrations and oscillograms, and methods of opening and closing circuit are explained.

Individual Design Features

Horizontal and vertical forms of metal-clad switchgear that have become familiar in this country do not appear to the author to be capable of advantageous application to air-blast types. The former were originated to facilitate the inspection and maintenance of oil breakers, provision for removing their tanks necessitating the terminals being brought out vertically at the top. These considerations do not apply to air-blast switches, which the author considers to be more adaptable to horizontal draw-out equipment of sheet-steel construction. To attempt to alter configuration merely to preserve features of an older device that is really quite different in nature will unduly handicap development of the newer design.

At this stage of development it is not considered that air-blast breakers, except for special duty demanding very frequent operation, will compare favourably in cost with oil types at rupturing capacities below 250 MVA at 11 kV. But it is not easy directly to compare costs when allowance has to be made for the omission of fire precautions which are unnecessary with equipment that does not incorporate combustible materials and is free from the explosion danger.

Final conclusions are that the axial blast principal can be applied readily at from 6·6 kV upward at standard ratings, susceptibility to rates of rise of recovery voltage being overcome with ease by the incorporation of parallel resistors, which also limit harmful over-voltage. As operation is positive, arcing times are minimised at all current values. There is little deterioration of contacts, which therefore have a long life under repeated operation. Since the "making" contacts are exposed they may be easily examined while clean and speedy inspection of the arcing contacts is possible; only three minutes is required to dismantle and inspect one interrupting chamber.

U.S. Power Production

Federal Commission's Report for 1941

A REPORT has been issued by the Federal Power Commission of the United States dealing with the generation of electricity and the installed plant capacity in 1941. In general the figures vary little from those already published by the Edison Electric Institute (*Electrical Review*, March 20th, 1942). Detailed information is included for each geographical division and an analysis is given according to the three main types of prime mover—water, steam and internal-combustion engine. Data of the latter kind is set out below:—

Class	Production in million kWh		Capacity in kW	
	1940	1941	1940	1941
Hydro	47,753	51,262	11,675,300	12,263,587
Steam	95,675	115,276	29,019,102	30,823,455
I.C.	1,557	1,632	944,554	1,005,159
Total	144,985	168,170	41,638,956	44,092,201

The total production was the highest ever recorded and showed an increase of 16·0 per cent. on 1940. The increased utilisation during 1941 was reflected in the higher plant load factor of 44·8 per cent. against 40·3 per cent. in 1940. The factor for hydro-electric plant improved from 47·1 to 48·9 per cent. and that for steam plant from 38·2 to 44·0 per cent.

Although the total plant capacity was substantially greater the number of generating plants decreased from 4,109 to 4,070. The number of privately owned plants reported to the Commission declined from 2,864 to 2,762, while there was an increase in publicly owned plants from 1,245 to 1,308.

Production of electricity in the nine geographical divisions was as follows (in million kWh; 1940 figures in parentheses): New England, 10,431 (8,968); Middle Atlantic, 41,312 (36,383); East North Central, 39,385 (33,612); West North Central, 9,971 (8,481); South Atlantic, 20,980 (17,617); East South Central, 10,086 (8,472); West South Central, 8,840 (7,434); Mountain, 9,259 (8,544); and Pacific, 17,905 (15,472).

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE Finchley Corporation has released **Mr. C. R. Westlake,** M.I.E.E., general manager and engineer of its electricity undertaking, for special military duties. In his absence **Mr. C. Bradley,** A.M.I.E.E., deputy general manager and engineer, will take over Mr. Westlake's duties.

Mr. G. Sommerville, borough electrical engineer of Faversham, has reached the retiring age of sixty-five, but his services are to be retained for another year. Mr. Sommerville has been in charge of the electricity works from their inception nearly forty years ago.

Major F. J. Chapple, D.S.O., the general manager of the Bristol Tramways and Carriage Co., has been elected to the board of the company.

Mr. H. B. R. Rowell has been appointed a director of the North-Eastern Electric Supply Co., Ltd.

Sheffield Corporation Electricity Committee reports the resignation of **Mr. T. Yule,** assistant construction engineer.

York Corporation Electricity Committee has appointed **Mr. T. P. Gervis** as analytical chemist at the power station.

Mr. G. W. F. Horner, who was recently appointed senior area engineer, Twickenham and District, by the London and Home Counties J.E.A., attains retiring age during the current year. The General Purposes Committee recommends that he shall be continued in the service of the Authority, on a temporary basis, after the date of his retirement.

Mr. Leslie C. Gamage, vice-chairman and joint managing director of the General Electric Co., Ltd., has been elected president of the Institute of Export for 1943.

The annual general meeting of the Birmingham Electric Club is to be held at the Grand Hotel on Monday, March 29th at 5.20 p.m. **Mr. J. W. Donovan** has been nominated for re-election as president with Messrs. A. M. Fletcher and A. T. Haywood as vice-presidents; J. H. Asdell, hon. secretary; M. J. Penford, hon. treasurer; and J. E. Oakley, hon. social secretary. The report of the club records an increase in membership from 418 to 433.

By permission of the Mersey Railway Co. **Mr. J. H. Fowles** is to act as general manager and engineer of the Liverpool Overhead Railway pending the appointment of a successor to **Mr. W. L. Box,** who has resigned for health reasons.

Salford Corporation Transport Committee has extended the arrangement under which the services of **Mr. J. W. Blakemore,** general manager, are retained in a temporary capacity, for a further year to May, 1944.

Sir Charles Darwin, F.R.S., who was appointed scientific adviser to the Army Council last year is returning to his duties as Director of the National Physical Laboratory. His place will be taken by **Professor C. D. Ellis,** F.R.S., the deputy scientific adviser.

Alderman W. Bradley, chairman of Bolton Transport Department, has been appointed chairman of the Joint Industrial Council for the Road Passenger Transport Industry.

Obituary

Major J. J. Murphy.—We regret to report the death of Major J. J. Murphy, D.S.O., secretary to the Council of the British Electrical and Allied Industries Research Association, which occurred suddenly at his home on February 22nd. He was in his sixty-second year.

The late Major J. J. Murphy

Major Murphy was educated at Dover and in Ireland and held several posts in the motor industry before the last war, during which he was in command of a mechanical train of the 2nd Cavalry Division. He was mentioned three times in despatches and was awarded the D.S.O. in 1915, being promoted to the rank of major in the same year.

He remained in the army for a considerable period after the war. He then joined the National Federation of Property Owners as organising secretary and in 1931 went to the Electrical Research Association as secretary to the Council, a capacity in which he came into contact with many members of the electrical manufacturing and supply industries.

Mr. H. W. Kolle.—The death occurred on February 16th, at the age of seventy-nine, of Mr. Harold Werner Kolle, A.M.Inst.C.E., M.I.E.E., who took an active part in the early development of electric light and power plants both in this country and on the Continent. Mr. Kolle was educated at Cheltenham College, and at Nyon, near Geneva, and after completing a course at the School of Telegraphy and Electrical Engineering, served in the works of Ferranti, Thompson and Ince., Ltd., by whom he was sent to Paris to build their first foreign machines. Later he was appointed to their staff.

On the amalgamation of Ferranti, Thompson and Ince with the Hammond Electric Light Co., Ltd., Mr. Kolle carried out a number of complete installations for ship, theatre and factory lighting, including the early power station at Eastbourne, and later he became manager of the Eastbourne Electric Lighting Co., Ltd. He resigned this appointment in 1888 to become personal assistant to Mr. S. Z. de Ferranti, who was at that time engineer and contractor to the London Electric Supply Corporation, Ltd., and Mr. Kolle did valuable work at the Grosvenor Gallery station and in the erection of the Deptford station. In 1892 he undertook for his company a hydraulic survey for creating a minimum of 30,000 HP at Laufenburg, on the

Rhine, and he also supervised the erection of electrical plant at the Portsmouth power station.

In 1895 Mr. Kolle joined Babcock-Wilcox, Ltd. (now Babcock & Wilcox, Ltd.) as London office manager and held this position until he retired in 1919. He became a director of the company in 1927 and remained on the board until his death. He was also a director of Ferranti, Ltd.

Mr. C. E. Abell.—We regret to report the death, on February 24th, of Mr. Charles Edmund Abell, A.M.I.E.E., A.M.I.Mech.E., who until his retirement in 1936 was chairman and managing director of Abell & Smith's Electrical Co., Ltd., electrical engineers and contractors, Worcester. Mr. Abell was born in 1884 and was educated at Worcester Cathedral King's School and Finsbury Technical College.

Mr. R. Smith.—We regret to record the death of Mr. Ralph Smith, formerly chief chemist of the D.P. Battery Co., Ltd., which occurred on February 15th at the age of seventy-one. Mr. Smith joined the D.P. Battery Co. in 1901 and retired in 1935. The interment took place at Bakewell on February 17th and was attended by members of the staff and employees of the company, while the floral tributes included wreaths from the directors and staff.

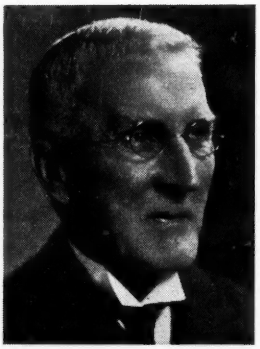
Mr. W. H. Isherwood.—We learn with regret of the death of Mr. W. H. Isherwood, a director of the Yorkshire Switchgear & Engineering Co., which occurred on February 27th. Mr. Isherwood was sixty-eight years of age and had been a director of the company since 1911. Although in failing health in recent years he has nevertheless taken an active part in the company up to within a few days of his death which followed a brief illness.

Mr. W. H. Swallow, of Uckfield, Sussex, who died recently at the age of fifty-nine, was for twenty-three years engineer and manager of the Uckfield Gas & Electricity Co., Ltd., retiring on account of ill-health in 1940.

Capt. E. S. Dashwood.—The death occurred recently at Ballykeelbeg, Portrush, of Capt. Eustace S. Dashwood, M.I.E.E. Capt. Dashwood was born in England, but went to Belfast many years ago. He joined Wm. Coates & Son, Ltd., electrical engineers, and subsequently became managing director of the company.

The Late Rollo Appleyard

WE report with regret the death, at St. Mary's Mansions, W.2, on March 1st of Mr. Rollo Appleyard, the well-known physicist and cable engineer, at the age of seventy-six. Mr. Appleyard was born in London and was educated at Dulwich. Later at the City and Guilds Institute he was with Professors Ayrton and Perry and took part in the development of electrical instruments and machines. Then he was for a time demonstrator at Bedford College, London, and after further practical training he was appointed an assistant in physics and telegraphy at the Royal Indian Engineering College, Cooper's Hill where his work during seven years included investigations into photo-electricity and radio waves.



Mr. Rollo Appleyard

He joined the India Rubber, Gutta Percha & Telegraph Works Co. in 1892 and was sent by the company to Brazil in connection with the submarine cables between Pernambuco and Santos. He was also responsible at a later date for considerable improvements in the operation of the Pacific cable between San Francisco and Honolulu. He remained with the Silvertown Company for over twenty years as head of a research laboratory and manager of a department. During this period he studied a number of physical subjects, particularly the electrical properties of copper and other metals and he developed a conductometer which he described in a paper read before the Institution of Civil Engineers in 1903; for this he was awarded a Telford Premium. Seventeen years later he again received a further Telford Premium.

Early in the last war Mr. Appleyard went as a commander, R.N.V.R., to the Admiralty where he was appointed to the War Staff for the Convoy Section. He was lent to the Air Service for a period when he assisted in the development of a number of navigational instruments. Later he founded and directed the Technical History Section of the Admiralty and found in this post scope for his literary talents. In 1920 he left the Admiralty and after acting for a time as engineer to Crosse & Blackwell, Ltd., he joined the International Standard Electric Co. and was afterwards on the staff of Constable & Co., the publishers.

His activities as a writer included membership of the staff of the *Times Engineering Supplement* for nine years, contributions to the *Fortnightly Review*, and articles in the *Electrical Review* and other technical publications. He contributed a masterly survey of submarine telegraphy to our Jubilee Issue of November 17th, 1922. He was the author of a number of books including "Pioneers of Electrical Communications," biographies of Sir Charles Parsons and Sir Aston Webb and "The History of the Institution of Electrical Engineers," which was reviewed by Dr. Alexander Russell in the *Electrical Review* of November 24th, 1929.

Mr. Appleyard was an O.B.E. and a member of the Institutions of Civil and Electrical Engineers. He married in 1901 and had one son who predeceased him. The funeral took place at Golders Green Crematorium on Wednesday last.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

I.E.E. Generation Section

WHILST I welcome constructive criticism, I cannot see anything in Mr. W. H. Dunkley's letter in your issue of February 26th that is likely to be helpful to a consideration of this subject. Regarding his reference to a " house of many mansions," in due course we shall all enter this house (I hope), even if it is not an engineering one. In the meantime, we are concerned with the generation of electricity for our present needs. I have no doubt that more efficient methods will be made available if we all give of our best.

I read the I.E.E. transactions—at least those which I can understand and appreciate—and it was through the Press reference in question that I came to realise that I should be taking Part 2 of the *I.E.E. Journal*. So long as a speaker can put over his questions in an understandable manner there is no great need for the special interest in elocution that Mr. Dunkley mentions.

Shipley, Yorks. T. H. CARR, A.M.Inst.C.E.

Coal Finance

QUOTATIONS from a report in a recent issue of the *Economist* bearing upon the difficulties in the colliery industry caused by the war, will evoke a strong feeling, I hope of sympathy, from their fellow sufferers, the electricity supply industry.

The full accounts of a colliery company for the year to December last show a drop in total income from £1,099,638 to £801,933, the lowest level since 1938. The directors state that the setback is due to the rise in costs. " The management is able to repeat the total ordinary payment of 15 per cent. and the transfer of £50,000 to general reserve ; to raise the transfer to development reserve from £60,000 to £82,651 ; and to increase the carry forward from £136,121 to £150,029. The balance sheet shows a number of swollen liquid items. The chairman points out that the rise in debtors from £519,723 to £543,428 is due to the latest advance in the price of coal. On the question of the ultimate organisation of the industry, he understandably stresses the importance of arriving at a permanent settlement with the minimum of delay. The £1 ordinary stock at 52s. ex dividend, yields £5 15s. 3d. per cent."

How well we appreciate the meaning of the terms " rise in costs " and " drop in total income." But it would be less than chivalrous if we did not applaud the ability of the colliery management to " repeat the total ordinary payment of 15 per cent."

Many of us in the electricity supply industry who have to dispose in one way or another of the material which we receive from the collieries, have had unkind things to say of collieries and of coal prices at times, but as the " rise in debtors from £519,723 to £543,428 " will show, each " latest advance in the price of coal " does not bring unmixed blessings to the collieries. We may not be able to publish our balance sheets, and we may soon have to find some other material than coal from which to generate electricity, but we will join in stressing " the importance of arriving at a permanent settlement with a minimum of delay."

JUNIAS.

Voltage Drop

COMPLETE independence of tables and slide rules in arriving at an approximation of cable sizes required under the varying conditions of current to be transmitted, length of run and permissible voltage drop can be attained by adopting the method described below, which I have used for years.

Take a cable with conductors each having a cross-sectional area of 0·001 sq. in. and carrying 3 A. The length of cable (lead plus return) is 40 ft. and the voltage drop is 1 V. The voltage drop being in direct proportion to current and resistance, and so to length of cable, the basis can also be stated as : 0·001 sq. in., 1 A, 20 yd. run (point to point) and 1 V. These values consisting of three ones and a twenty can be readily committed to memory. They constitute an easily manipulated base from which, appreciating that the cross-sectional area of the cable is inversely proportional to voltage drop, and given any three values, the fourth unknown value can be quite easily found.

For example: ascertain the cross sectional area required (the most common problem) when current is 40 A, the length of run is 80 yd. and the permissible drop is 3 V. Multiply 0·001 sq, in. stated as one-thousandth of a sq. in. by the current value, 40 (direct proportion) = 40 thou's. Multiply this by the approximate number of times the length of run in yards can be divided by 20, *i.e.*, 80/20 = 4 (direct proportion), giving 160 thou's. Now divide by the permissible voltage drop, 3 (inverse proportion), which gives 53 thou's, or ·053. A ·06 sq. in. cable is therefore indicated.

This stated as a formula is:—

$$\text{Cross section area in thou's of 1 sq. in.} = \frac{\text{Current} \times \text{Length of point-to-point run in yd.}}{\text{Permissible voltage drop} \times 20}$$

With a little practice these and associated

problems become merely cases for simple mental arithmetic, well within the understanding of those very practical people to whom multiplication by 10^{-5} would be a mystery and who would be at a loss to apply Mr. J. W. Alexander's method in your issue of January 22nd to meet variations of permissible voltage drop from the value of 5, as stated by him, or to calculate the value of an unknown quantity other than the cross sectional area.

Wakefield. F. J. FARMER,
Electrical Engineer,
W.R. County Education Committee.

Electrical Engineering Scholarships

Institution of Electrical Engineers

APPLICATIONS, which must be received not later than April 15th, are invited for the following scholarships awarded by the Council of the Institution of Electrical Engineers. Inquiries for full particulars and nomination forms (specially mentioning the name of the scholarship) should be addressed to the Secretary of the Institution, Savoy Place, London, W.C.2. It should be noted that in consequence of the present regulations of the Ministry of Labour and National Service these awards can only be made to candidates who were born on or after January 1st, 1925, and who could complete a degree course by the end of December, 1945.

Duddell Scholarship (value £150 per annum, tenable for three years).—Open to British subjects who have passed the matriculation examination of a British university or an examination exempting from matriculation, and who wish to take up a whole-time day course in electrical engineering. Each candidate must be nominated by a corporate member of the Institution, and preference will be given to candidates whose fathers or a near relative are, or have been, members of the Institution.

Silvanus Thompson Scholarship (value £100 per annum and tuition fees, tenable for two years, renewable in approved cases for a third year.)—For works employees who are the sons of parents of limited means. Open to British subjects who (*a*) have served a minimum apprenticeship (or its equivalent) of three years at an approved electrical engineering works, and (*b*) in addition to having taken full advantage of available opportunities for technical education have acquired a marked degree of skill and/or shown evidence of originality. The successful candidate will be required to take up a whole-time day course in electrical engineering at an approved university or technical college. Each candidate must be nominated by a corporate member of the Institution.

Faraday House

The annual examinations for a Faraday Scholarship of eighty guineas per annum, tenable for two years in college, and for a Maxwell Scholarship of sixty guineas per annum, tenable for two years in college, will be held at Faraday House, on April 6th, 7th and 8th next. The subjects of examination for the Faraday Scholarship are geometry, algebra, trigonometry, dynamics, statics and hydrostatics, geometrical and freehand drawing, chemistry and physics. For the Maxwell Scholarship the subjects are mathematics, dynamics, statics and hydrostatics. Further particulars may be obtained from the Registrar, Faraday House Electrical Engineering College, 62–70, Southampton Row, London, W.C.1.

Brush Electrical Engineering Co.

A number of engineering scholarships of £75 value per annum, tenable for four years, the first year of which is spent in the company's works at Loughborough, are available for award by the Brush Electrical Engineering Co., Ltd. In addition to the university work leading to a degree, the course provides training in the various departments of the company covering the production of steam turbines and turbo-alternator sets, electrical machines and switchgear, internal combustion engines and coachwork. This training is designed to suit students for entry as operating engineers to power supply companies, road transport undertakings, steelworks, etc.

Applications for scholarships should reach the company before May 31st, 1943. An outline of the courses available is given in the company's publication, "Engineering as a Career."

News from France

Effects of Drought

THE consequences of the prolonged drought in France are shown in an article on the Sarrans Dam at Truyeri published in *L' Illustration*. There is normally an annual flow of 290 million cu. metres into the artificial lake, but this has been reduced to 40 million cu. metres and electricity production has fallen from 5,500,000 kWh to 1,200,000 kWh. The article remarks that this unprecedented fall in water level has brought back to view a weird landscape. Some kilometres from the dam a thirteenth century Gothic bridge has reappeared. Skeletons of trees have emerged here and there, and at the foot of the dam grills through which the water has filtered into the turbines are now being cleaned for the first time. A hamlet which has been totally submerged since 1934 is once more visible. The roofs of the houses have mostly caved in, but the walls still remain. The tracery of roads and paths is still clearly visible. The earth, which is now temporarily drained, is seared and cracked by the drought.

No New Consumers

No new electricity consumers are to be accepted, and all consumers are forbidden to increase consumption. Dispensation from this decree is obtainable, in special circumstances, from the Director of Electricity. All forms of electric heating are also forbidden except where there are no other means of heating.

Schemes Held Up

Shortage of raw materials is holding up the completion of a number of power developments planned and started before the war. The new Rhone station at Genissiat, which should be able to produce 1,700 million kWh a year is not yet finished and the Aigle power station on the Middle Dordogne, which will produce 400 to 500 million kWh annually, will not be ready before the middle of 1944.

COMMERCE and INDUSTRY

Repairing Domestic Appliances. *Segregation of Scrap.*

E.D.A. Annual Luncheon

MAJOR Lloyd George, the Minister of Fuel and Power, will be the principal guest at the annual luncheon of the British Electrical Development Association on March 19th. The chair will be taken by Alderman A. A. Senington, president of the Association.

Mutual Aid in Repairs

Appliance repairs seem to form a useful activity for a mutual aid group of electricity supply undertakings. In one such group in the Mid-East England Area, up to November 30th last, the authority acting as the repair depot for five undertakings had repaired 474 solid type boiling plates, 285 kettle bodies, 23 grills, 52 wash boilers, a refrigerator and 53 rotary switches. The cost of the work is said to have been £238.

Similar work is being carried out among the six other groups in the area. Some delay has been caused by the necessity to train labour but as this difficulty is overcome repairs will proceed at a quicker rate and probably at lower cost.

Export of Mica

Under the Export of Goods (Control) (No 3.) Order, 1943 (S.R. & O. 1943 No. 231), which comes into force on March 8th, control is extended to cover materials containing mica and articles made therefrom. The existing licensing requirements with respect to mica, articles made wholly or mainly of mica, and mica backed or edged with other materials are superseded by the provisions that licences will, in future, be required to export mica, micafolium, micanite, mycalex, micarta and similar insulating materials containing mica, whether or not backed or edged with other materials and articles wholly or mainly of the foregoing.

Identification of Steel Scrap

A colour scheme which it is hoped will assist workpeople and managements in war factories to segregate essential alloy steel scrap more effectively has been devised by the Iron and Steel Control. In future the following colours will be used to identify the various grades :—Carbon, white ; nickel, red; nickel chrome, blue; nickel chrome molybdenum, green; manganese molybdenum, brown; carbon chrome (ball bearing), black; chrome molybdenum, orange; and stainless, pink.

Producing works are urged to do everything possible to avoid mixing alloy steel scrap with carbon scrap, and alloy steel scrap should be sorted into appropriate grades.

The Iron and Steel Control says that hundreds of tons of valuable alloys are lost every week in steelworks because of poor segregation in factories and scrapyards. Accidental mixture produces faulty steels and unless care is taken to sort this type of scrap at source it is impossible for the steelworks to make reliable new armament steels from it.

To advise managements on effective measures for the adequate segregation of alloy steel scrap a number of inspectors have been appointed by the Ministry of Supply. They are attached to the Scrap Department of the Iron and Steel Control, Ashorne Hill, Leamington Spa, Warwickshire, to which all correspondence should be addressed.

An amusing and effective poster illustrating the colour scheme has been prepared for issue by the inspectors to suitable works.

Business Premises War Damage Premium

The Board of Trade announced in September last that, with the approval of the Treasury, it had been decided that the premium payable under the business scheme for the twelve months ending September 30th, 1943, should not exceed £1 per cent. For the period of six months to March 31st, 1943, the rate of premium was fixed at 10 per cent. Having regard to present conditions and to the amount already paid by way of premium, the Board has, with the approval of the Treasury, decided to fix the rate of premium for the whole of the year to September 30th, 1943, at 15s. per cent., so that the premium to be paid for the six months April 1st to September 30th, 1943, will be 5 per cent.

Purchase of Machine Tools

The Machine Tool Control asks us to notify readers that firms requiring to make private purchases of machine tools should apply to the appropriate Regional Director of the Machine Tool Control and not to the Control headquarters. Applications for Government-financed machines must still be made through the Services concerned.

The addresses of the Regional Directors are as follows:—*Northern*: Clarendon House, Clayton Street West, Newcastle-on-Tyne, 1. *East and West Ridings*: Pearl Chambers, East Parade, Leeds. *North Midland*: 51–55, Clifton Boulevard, Nottingham. *Eastern*: 35, Old Queen Street, London, S.W.1. *London and South-Eastern*: 2, Queen Anne's Gate Buildings, London, S.W.1. *Southern*: Oxford Street Chambers, Oxford Street, Reading. *South-Western*: Royal London House, Queen Charlotte Street, Bristol. *Wales*: 56, Cathedral Road, Cardiff. *Midland*: C. M. L. Buildings, Great Charles Street, Birmingham. *North-Western*: Britannia House, Fountain Street, Manchester. *Scotland*: 21, Glassford Street, Glasgow, C.1. *Northern Ireland*: Ministry of Supply, Law Courts Buildings, Chichester Street, Belfast.

Training of Chinese Engineers

The F.B.I., at the request of the Chinese National Government and with the approval of H.M. Government, has agreed to grant facilities for a number of wartime apprenticeships whereby Chinese engineering graduates can be trained in British workshops. About 30 vacancies in all

branches of engineering have been offered by British manufacturers, and Chinese graduates are now being selected by an Anglo-Chinese Committee specially set up in Chungking. Expenses will be defrayed from contributions from the Chinese Government and from the manufacturers concerned, and also from funds made available by the Universities China Committee in London and the British Council. Administration of the scheme is in the hands of the F.B.I. In the past ten years, under the F.B.I.'s auspices, 60 selected Chinese engineering graduates (apart from those trained by direct arrangements with British firms) have received practical training in British workshops.

Widow's Claim Fails

Judgment was given for the Mid-Cheshire Electricity Supply Co., Ltd., in an action at Chester Assizes last week. The company was sued by Mrs. Annie Stringer as administratrix of the estate of her husband, a fitter's mate, who received a fatal electric shock while in the company's employ.

For the plaintiff it was stated that Stringer was boring holes in a steel plate when suddenly the electric drill flew from his hands and he fell to the ground and died three or four hours later. It was submitted that the connections to the drill were improvised and had no earthing device. The defence was a denial of the allegations with counter-allegations that Stringer's death was caused by his own negligence or contributory negligence in failing to ask a more experienced man to supervise the connecting of the drill to the supply.

Mr. Justice Wrottesley gave judgment for the company, but under the Workmen's Compensation Act compensation of £350 was agreed to. The judge ordered that £100 of the costs of the defence should be set off against the amount of compensation.

New Uses for Glass

Transparency and fragility have unfortunately tended to obscure the remarkable versatility of glass. It is to draw attention to some of the other qualities and their application to present-day war problems and its uses in post-war development that an exhibition is now being held at the Building Centre, 23, Maddox Street, London, W.1. Arranged by the Department of Glass Technology, Sheffield University, in conjunction with the Glass Manufacturers' Federation and the Building Centre, the exhibition includes a range of radio valves from the small all-glass valve less than an inch in length to a water-cooled transmitting valve measuring over 4 ft. in length and capable of an output of 100 kW.

Glass is to be seen drawn into fibres finer than human hair and woven into cloth and tape used for electrical insulating purposes, while the fibre is also employed for heat and sound insulation. There are also glass insulators for overhead line and radio work, glass frying pans and saucepans that can be used directly on a hotplate, and attention is drawn to the fact that glass can be produced to eliminate any desired light rays, a feature which is made use of in the manufacture of fluorescent lamps.

The idea that all glass is brittle should be dispelled by the fact that bullet-proof windows are now being used for aircraft and tanks. As Sir E. Owen Williams, who opened the exhibition pointed out, weight for weight glass was much stronger that steel and it was subject to control as no other substance was. Incidentally, a further quality of glass flexibility, was demonstrated during the opening ceremony when the speakers stood on a plate of toughened glass, ¼-in. thick, which it was claimed would carry a weight of over 200 lb. without breaking, though it bent very appreciably. The exhibition will remain open until March 12th.

Hire Purchase (Control) Order

The Board of Trade have made an Order postponing until March 22nd the operation of the Hire Purchase (Control) Order. The Order, as originally made, was to have come into operation on March 1st. This postponement has been made to give time for a fuller examination of the representations of the traders affected that the Order should be modified in certain respects.

Inquiry from Istanbul

An import and export merchant in Istanbul, Turkey, who is a regular reader of the *Electrical Review*, wishes to get into touch with British manufacturers of electrical goods and apparatus. He desires to secure sole selling rights for Turkey, immediately if possible, but at any rate after the war. We shall be glad to pass on his name to interested readers.

Electrical Supplies in Eire

Speaking at the annual meeting of the Society of Irish Electrical Traders in Dublin last week, the president (Mr. R. J. Leonard) said that the small amount of electrical material going into Eire was getting into the hands of unscrupulous dealers instead of the proper trade channels.

It had been a difficult year for all members and some of them had had to close their businesses and seek employment outside the country.

There had been many complaints about the supply of cable and the Council had requested wholesalers to distribute their limited supplies only to those firms which employed electricians. An investigation into complaints regarding lamps had revealed that materials which were alleged to have been produced by a certain company had not in fact been made by that company.

Developing Rhodesian Industries

The need for industrialisation of Southern Rhodesia was emphasised by the Minister of Mines and Public Works, Col. E. Lucas Guest, when opening the Iron and Steel Commission's Laboratory in Bulawayo which will probably expand into a National Physical Laboratory. The Government was convinced, he said, that industrialisation was the only means whereby rapid development was possible. The Minister considered that industrial interests in the United Kingdom would probably not be averse to industrial development in the outposts of the Empire after the war and might even co-operate. Cheap electric power was essential and it was believed that the establishment of a hydro-electric undertaking at Kariba Gorge (on the Zambesi River about 200 miles below

the Victoria Falls) would contribute greatly to the successful establishment of industries, particularly for processing base minerals.

Expressing the Government's policy, the Minister said that while he did not wish to minimise the value of smaller industries, often based on imported raw materials, these were not the industries they had in mind but rather industries such as the Iron and Steel Corporation which aimed at production from the natural wealth of the country and producing a commodity through which further industries could be established. Thus they could provide employment not only for returned soldiers but also for new settlers.

Plastic Developments

Some of the latest developments in plastics were demonstrated this week by Runcolite, Ltd., and its associated companies, British Artificial Resin Co., Ltd., and Plastic Spray, Ltd., at their showrooms at 3, Vere Street, London, W.1. "Metrelite" metal-sprayed synthetic resin bonded boards, glass fabrics, etc., are now being employed extensively in place of aluminium for screening radio and suppression apparatus, while "Plastotex T" being resistant to sea water, some groups of oils, petrol and gas, flexible over a range of temperatures, and unaffected by weather or atmospheric oxidation, provides an alternative to rubber for waterproofing fabric. Transparent plastic materials are finding increasing use in the construction of models for research or instructional purposes, and "Graphic Nuprint," which is not affected by weather, oil, petrol or sea water, is proving of great value, in substitution for tin, brass and chromium plating.

"The Crabtree"

After a long interval "The Crabtree," the little magazine "published every little while" by J. A. Crabtree & Co., Ltd., has reappeared in a new form. It is now the avowed intention of the company to present in the magazine "such material by our own and other thinkers as will give point and purpose to the national war effort." This issue therefore contains a reproduction of an address delivered by Mr. Paul H. Appleby, the United States Under-Secretary of Agriculture, last year in which he describes wartime Britain and stresses the necessity for the closest collaboration between the two countries now and afterwards.

It is hoped to publish four issues a year and the nominal annual subscription is 6d.

War Damage Regulations

The Treasury has issued through the Stationery Office the War Damage to Goods (General) Regulations, 1943 (S.R.& O. 1943 No. 209 3d.), which supersede the regulations made in 1941. They relate to both the private and business chattels schemes.

Measuring Tin Coatings

Now that it is so important that tin should be used as economically as possible it is necessary that manufacturers should be able to assess the thickness of coatings they are applying, which has hitherto presented some difficulties. The full range of methods available for doing so is given in the Tin Research Institute's publication No. 115, which also contains useful conversion tables showing the weight of tin on various units of area, corresponding to different thicknesses of coating. Copies may be obtained free of charge from the Tin Research Institute, Fraser Road, Greenford, Middlesex.

Trade Announcement

For many years D. Gilson & Co., Ltd., has been a wholly owned subsidiary of Davis & Timmins, Ltd. With the continued expansion and wartime difficulties, it has been found necessary to make the following arrangements for closer working :—As from March 1st, the sales and accounts collection work for both companies will be carried out under the name of Davis & Timmins, Ltd. All orders, inquiries, correspondence, etc., should be addressed to, and all cheques made payable to, Davis & Timmins, Ltd. The head offices of both companies will be at Billet Works, Billet Road, London, E.17 (telephone : Larkswood 2244).

Calendar

Lancashire Dynamo & Crypto, Ltd., have sent us a neat calendar for the year to February 29th, 1944. A feature of this calendar, which shows the twelve months on one sheet, is that it is printed on cloth and the company does not therefore have to make a charge for it. A limited number are still available on application to the company's Publicity Department, 94, Petty France, Westminster, London, W.C.2.

Change of Address

The staff of Edison Swan Cables, Ltd., are removing to 155, Charing Cross Road, London, W.C.2.

TRADE MARK APPLICATIONS

THE following application has been made for a British trade mark. Objections may be entered within a month from February 24th :—

ASEA. No. 620,610, Class 9. Scientific, nautical, surveying, measuring, signalling and checking (supervision) instruments and apparatus, all being electrical goods ; electrical instruments and apparatus not included in other classes, electric cables and wires ; and parts (not included in other classes) of all the said goods.—Asea Electric, Ltd., Fulbourne Road, Walthamstow, London, E.17.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the makers of the following :—

SPEEDY vacuum cleaner.

PLENAM starter.

Ibbetson & Co., Ltd., of London (address).

Power Station Accessories

Varying Practice to Suit Local Conditions

By T. H. Carr, A.M.Inst.C.E., A.M.I.Mech.E., A.M.I.E.E.

ON reviewing the many items of plant and apparatus which go to make up a power station, it becomes clear that the relative value attached to each varies in different stations. An item which is considered of prime importance in one station may not even be included in another, and one is often left wondering just how this difference of view came about.

It is the general practice for each large turbo-alternator to have its own unit exciter. Although experience has shown direct-driven exciters to be very reliable, numerous cases have occurred where failures, possibly quite small, have necessitated taking sets out of service, often when they are most needed. A stand-by exciter is then a valuable asset and its capital and running costs are relatively small compared with the cost of losses incurred, apart from the resulting inconveniences. Many of the larger stations have either independent or direct-driven house sets. Both have their specific advantages and disadvantages and should be compared on their merits for each particular station.

The majority of stations in this country have only one crane, but experience indicates that a second, particularly if placed immediately above the main crane, has decided advantages both during the construction and the later running of the station. The additional cost is repaid in more ways than one in a large station. This becomes apparent when both maintenance of existing turbine plant and installation of new plant are in progress simultaneously.

Division of Condensers

In deciding whether a divided or undivided condenser should be adopted, local conditions play a leading part, the problems involved being those of circulating water and availability. With divided (generally twin-type) condensers, half of the tubes can be cleaned whilst the other half is still in service at reduced load, usually about half of normal rated output. This form of construction, although perhaps slightly more expensive, is now commonly adopted for both cooling-tower and riverside stations. Experience has shown that the divided condenser is essential for stations where the rivers carry large quantities of leaves, wool, thread or other debris and waste at certain periods of the year.

The arrangement of circulating water piping and valves is rather more expensive with the divided condenser, since each section must be isolated as desired, whilst an isolating valve is also required in each air-suction pipe. Here again full consideration must be given to local conditions.

The practice of fitting barring or turning gear to large turbo-alternators, especially those of 30 MW and over, appears to have been fully justified with the operating conditions at present obtaining in many of the medium-sized stations. The cost is reasonable provided too many frills are not included.

Air ejectors, especially the steam-jet type, are probably the most reliable of all power station auxiliaries, but this does not imply that they are entirely trouble-free. The minor troubles recorded have no doubt led many engineers to include two 100 per cent. ejectors on each turbine. There are, however, stations with 30-MW sets having only one ejector each and no trouble whatever has been experienced. In some stations the stand-by ejector is arranged for circulation of the main cooling water, which may be sea or river water or sewage effluent. For quick-starting purposes a booster ejector is often incorporated and is an added advantage in emergency.

Synchronising Methods

The advent of telephones and telegraphs, together with steady turbine drives, has made possible the removal of the control board to a separate room which has many advantages from an operating point of view. The synchroscope, however, is a key instrument and in the early days, when the controlling switchgear and associated panels were housed in the engine room, both the switchboard attendant and the engine drivers usually had complete view of it.

In a few modern stations a synchroscope is still installed in the turbine house, where it is visible to the driver as well as in the control room. This is only a small point, but it is worthy of consideration, especially if it has been a feature of older stations of the same undertaking. Failure of remote-control speeder gear is also covered, since synchronising may be carried out from the turbine manual control.

Careful attention needs to be paid to coal-handling plant and in particular those items which take the coal to the boiler overhead bunkers. In the larger-capacity stations two 100 per cent. conveyors of the belt or bucket type are usually justified, whereas in small and medium-capacity stations, or where the boiler house is sub-divided, one 100 per cent.

conveyor is the general practice. There are stations where one conveyor is served by two elevators, but the possibility of conveyor failure, whilst small, should be allowed for. The driving equipment and belt are the likely sources from which trouble may arise and suitable spares are desirable. Two 50 per cent. conveyors and elevators are in use in some stations.

Within recent years the water lancing of superheaters appears to have justified its adoption by extending the boiler steaming periods.

It may be said, in conclusion, that every power station, however well-designed, is a compromise between conflicting factors and the question as to what is and what is not to be installed must still generally remain a matter for individual judgment based upon local conditions.

Economy and Excess

Survey of Consumers' Reasons

ALTHOUGH the Minister of Fuel and Power has said that it is not proposed to resort to the rationing of gas and electricity for the present, the possibility of such a plan remains. It is therefore of interest to have as support for the view that equitable rationing is impossible a survey made by the London and Home Counties J.E.A.

In this survey 250 consumers who in a recent quarter exceeded their consumption in the corresponding period of the previous year and a similar number who used less were approached and, it is said, they responded extremely well. The idea was to ascertain the reasons for the economy achieved or the failure to reduce consumption.

Of the 250 who had effected savings 164 replied and an analysis shows that just over half of these (86) attributed the results to "simple economy." About a fifth (35) reported variations in household circumstances, generally in the number of residents, billeted workers, evacuees, etc., but also claimed definite economy ; 15 others with altered circumstances did not claim definite economy. In two similar cases economy was effected by means of alternative fuels. The latter reason was given by 12 other people; another consumer had changed fuels with no definite economy. The balance of 13 were not properly classifiable.

How Savings Were Made

The methods adopted to secure economy in order of "popularity" are stated to be :—Reduction in number or wattage of lamps; restricted use of apparatus (especially fires, cleaners, immersion heaters and radio sets); use of fewer rooms (*e.g.*, having meals in kitchen instead of dining room); economical use of cooker; use of coal fire for heating water and cooking; early retiring; and diligence in switching off lights when finished with.

The response from those who exceeded their corresponding quarter's consumption was appreciably better—208 of them attempted to justify the excess. The largest number (116) attributed it to variation in domestic arrangements (including alterations in the number of residents). A further 40 reporting altered arrangements also mentioned the substitution of electricity for other types of fuel. The latter reason was given by another 28. Faulty apparatus seems to have been the principal cause in nine cases. Five consumers expressed doubts as to the accuracy of their meters and the remainder (10) gave no reason.

This analysis is supplemented by a further one in a more detailed form. From this it is seen that 82 cases of excess consumption were due to increases in the number in households. Illness was responsible in 62 cases and irregular working hours and meals in six. In 14 instances the 1941 consumption was low because premises were vacant for part of the quarter. The substitution of electricity for other fuels was the cause of excess (as mentioned above) in 68 cases, and the difficulty of obtaining solid fuel was referred to in a number of instances. Other reasons given were use of part of premises for business purposes ; increased working hours (entailing earlier rising): fire watching; and cooking for chickens.

Unavoidable Circumstances

A large number of consumers claimed that the considerable economies which they had effected were nullified by some unavoidable occurrence, such as illness or increase in household, while several pointed out that economy had always been practised for financial reasons, making further reduction extremely difficult.

The report, which is the work of Mr. F. W. Purse, the chief engineer, and Mr. A. L. Burnell, finance officer, arrives at three conclusions, namely:—(1) That consumers appreciate the principles on which the Government is conducting its fuel economy campaign, in which there is evidence of widespread co-operation. (2) That, in general, the reasons given for increased consumption are such as would be expected to receive sympathetic consideration and additional allowances under any rationing scheme. (3) That any further economies compulsorily imposed would in many cases involve real hardship beyond the measure of inconvenience which, in general, has been accepted voluntarily already.

Copies of the report have been sent to the Minister of Fuel and Power and the Electricity Commissioners.

Restrictions in Hungary

IN order to reduce coal consumption the Government of Hungary has introduced a series of decrees restricting the use of electricity. Taking 1941-42 as the basic period, hotels, restaurants and clubs may use up to 70 per cent. of the amount consumed within that period. Important factories may use up to 90 per cent. while a large number of food industries are altogether exempt.

ELECTRICITY SUPPLY

Liverpool Rate Relief. Repairing Hired Apparatus.

Faversham.—ELECTRICITY ECONOMY. — The borough electrical engineer reports that as a result of the fuel economy campaign there was a decrease in consumption of 12 per cent. during the past three months.

Liverpool.—REDUCED RATE RELIEF.—A sum of £15,000 has been voted by the Electricity Power and Lighting Committee in aid of the city rates. Last year £40,000 was contributed. The *Liverpool Echo* explains that the reduction is due to the effect of the economy campaign on the Department's revenue, together with the Committee's policy of keeping charges as low as possible.

London.—FRIENDLY GESTURE.—It was reported to the Stoke Newington Council that the Gas Light & Coke Co. had offered to provide temporary accommodation at its showroom in the event of the Council's electricity showroom being seriously damaged through enemy action. The Council agreed to reciprocate.

COAL WEIGHT DISCREPANCY. — Fulham Electricity and Lighting Committee reported to the Council last week that it had approved a settlement made by the borough electrical engineer with various coal contractors in connection with discrepancies which had occurred between the weights of coal as advised by the colliery and as ascertained by the weighing apparatus at the power station. The settlement provided that the disputed amount should be borne in agreed proportions by the Council and the contractors concerned. The cost to the Council would amount to £4,446.

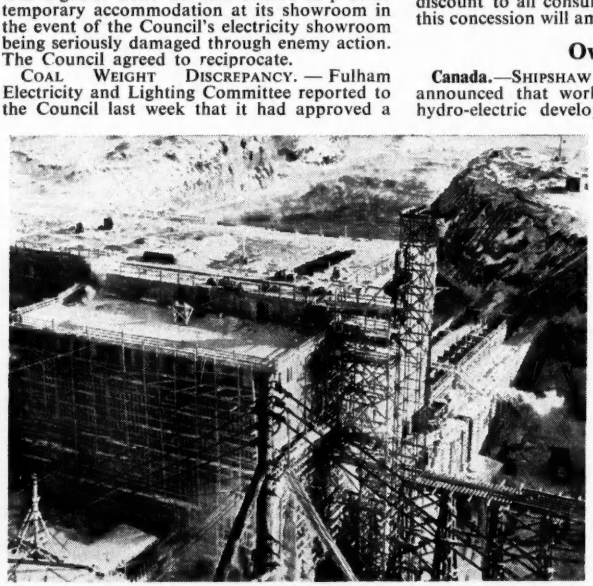
REPAIRS TO HIRED APPARATUS.—At a meeting of the Stepney Electricity Committee it was reported that difficulty had been experienced in maintaining apparatus on hire, particularly kettles and boiling plates, in a serviceable condition. The Committee was assured that so far as supplies permitted replacements would be made available for electric kettles and solid hotplates, but the cost of such replacements had increased so that according to present prices the kettle elements would cost an additional 5s. 10d., and 8-in. boiling plates an additional 7s. 9d. on pre-war prices. The Committee agreed to the hire charges being adjusted from time to time to meet further increased costs.

ST. MARYLEBONE.—The Borough Council Electricity Committee is applying for sanction to borrow £1,083 for meters and £5,440 for mains and services.

West Bromwich.—DISCOUNT.—The Electricity Committee has decided to make a 10 per cent. discount to all consumers. It is estimated that this concession will amount to about £35,000.

Overseas

Canada.—SHIPSHAW SCHEME.—It was recently announced that work on the large Shipshaw hydro-electric development of the Aluminum Power Co. on the Saguenay River, in Northern Quebec, was months ahead of schedule. Two of the ten 85,000-HP units have already been installed, in addition to which two 55,000-HP units are to be transferred from the Chute-a-Caron station, making 960,000 HP in all. At peak periods more than 10,000 men have been employed on the scheme.



The tail race leading to the initial half of the Shipshaw power-house

MANITOBA FARM ELECTRIFICATION. — A post-war farm electrification programme, which ultimately would serve nearly every rural home in the province, is urged in a report of the Manitoba Electrification Inquiry Commission. Extension of electrical power to the majority of the 58,686 farm homes in Manitoba is considered both feasible and practical, and the Power Commission and the Government should initiate immediate preparations so that plans may be proceeded with promptly when the war is over. A construction programme of 25,000 farm services in the first ten years is suggested as a minimum initial objective, with the installation of 1,000 services in the first year. The capital cost of these 25,000 services, based on 1939 figures, is estimated at $16,831,688, or approximately $673 per farm.

NEW BOOKS

Radio "Encyclopedia." Textbook for Examination Students.

Radio Engineering. Edited by Roy C. Norris, Pp. 512; figs. over 600. Odhams Press. Ltd., Long Acre, W.C.2. Price 6s. 6d.

This volume might almost be classed as an encyclopedia on radio, so great is the field covered in its 500 pages. The editor claims that the book covers a wider scope than any other single volume, a claim which is probably quite justified. Written by a panel of authors, all specialists in their particular branches of radio, the book is nevertheless quite uniform in style throughout, no mean achievement on the part of the editor. The subject matter is treated in a non-mathematical but very practical style, and is copiously illustrated with diagrams.

In all there are eighteen chapters, dealing with such subjects as "How Receivers Work," "Radio in Aviation," "Radio in Ships," "Short Waves," "Television," "Radio Service Equipment," "Fault Finding in Receivers," "Electronics," and so on. Possibly one of the most interesting chapters is that on "Radio Production Methods," a subject which, as far as the writer is aware, has never before received attention. The complete organisation and working of a typical mass production radio receiver and valve factory is described, with many illustrations.

From whatever angle one is interested in radio, this book should be of value. It does not attempt to go into every aspect in full technical detail, but is written and illustrated in a style which the general reader will find easy to follow.—W. E. M.

Applied Electricity. By A. M. Hirst, M.Sc. (Eng.), M.I.E.E. Pp. 290; figs. Blackie & Son, Ltd., 50, Old Bailey, London, E.C.4. Price 15s.

The author says that this textbook has been written for the student who is studying for examinations such as the Higher National Certificate or the Associate Membership examination of the Institution of Electrical Engineers. There is always a demand for textbooks which cover the necessary groundwork in technology and are neither too elementary nor too advanced. The present volume can be regarded as not only fulfilling its set purpose, but as guiding the student to the point where he may pass on to the more advanced works for his specialist subjects.

The fact that the book under review is in the nature of a sequel to the author's book, "Electricity and Magnetism for Electrical Engineering Students," to which many references are made, rather spoils the claim that this volume is in itself complete. The author indulges to an unnecessary extent in the use of the footnote. Page after page has a few lines of added information that could have been just as easily incorporated in the text.

For the readers for whom this book is written, the complete working out of typical examples is extremely useful. With these as a guide, the student can work through a representative number of the given problems (with answers) and thereby quickly master the subject. The author appreciates that the main object of a teacher should be to guide the young student, and not merely to throw at him a mass of indigestible material.

Why do so many textbooks on AC work perpetuate such terms as "true power" and "apparent power"? Power is power and no qualification is needed. The term "apparent power" is deprecated by the B.S.I. Why not use the recommended term volt-amperes or kVA? On the chapter on symbolic notation the author correctly stresses the fact that j is an operator, and that the arithmetical effect of operation by j, in the evaluation of expressions, is equivalent to multiplication by $\sqrt{-1}$. A few pages on polyphase circuits using symbolic notation, with a paragraph on phase sequence, would not have been out of place. Also, the induction regulator is in such everyday use that the inclusion of a note on its action would be justified. In the mercury-arc rectifier section a note on grid-control might be added.

As a whole the book is attractively written, the matter is sound, the diagrams are clear. The author has achieved what he set out to do—to provide a textbook giving a general knowledge of the subject without the detail given in more advanced work. This is definitely a student's book.—S.P.S.

Shorter Notices

Flight Handbook. Third edition. Pp. 224; figs. 137. Flight Publishing Co., Ltd., Dorset House, Stamford Street, London, S.E.1. Price 6s.

This handbook contains all the information necessary to acquiring a working knowledge of the theory of aeronautics and shows in language easy to understand how theory is applied to the various designs of aircraft. Opportunity has been taken in the new edition to add a section devoted to typical aircraft power units with some accompanying notes on supercharging.

J. J. Thomson. By Lord Rayleigh. Pp. 299; plates 8. Cambridge University Press, Bentley House, 200, Euston Road, London, N.W.1. Price 18s.

Teach Yourself Electricity. By C. W. Wilman. Pp. 184; figs. 115. English Universities Press, Ltd., St. Hugh's School, Bickley, Kent. Price 3s.

Experimental Radio Engineering. By E. T. A. Rapson. Second edition. Pp. 159; figs. 170. Sir Isaac Pitman & Sons, Ltd., Parker Street, Kingsway, W.C.2. Price 8s. 6d.

Electric Power System Control (Vol. XI of Monographs on Electrical Engineering). By H. P. Young, M.I.E.E., M.A.I.E.E., Head of the Electric Power and Machinery Section of the London Polytechnic. Pp. 319; figs. 214. Chapman & Hall, Ltd., 11, Henrietta Street, W.C.2. Price 25s.

Worked Examples in Physics. By L. J. Freeman, Ph.D., lecturer on physics at Chelsea Polytechnic. Pp. 186; figs. Hutchinson & Co. (Publishers), Ltd., 47, Princes Gate, London, S.W.7. Price 6s.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

The English Electric Co., Ltd., held its annual meeting on February 25th, when Sir George Nelson (chairman and managing director), after reviewing the accounts for the year, said that he had in previous years made reference to the taxation position, and particularly to that section relating to excess profits. Although they were faced with the cost of re-adapting their works to peace requirements and of carrying out much additional research and development, they had been able to place no more than £100,000 to general reserve. The 20 per cent. post-war rebate from E.P.T. formed a hidden reserve, but it was still true that a firm which had a good standard profit but made no extra war effort could provide more adequately for after the war than could one with a poor standard profit which had made a great war effort.

With regard to the acquisition of a controlling interest in D. Napier & Son, Ltd., holders of over 90 per cent. of the ordinary shares of that company having accepted the offer to exchange their holdings for ordinary stock of the English Electric Co., the directors had decided to take the steps authorised by the Companies' Act to acquire the remaining shares.

Mather & Platt, Ltd., held their annual meeting on February 25th. Mr. L. E. Mather (chairman) in his report circulated with the accounts said that the profit at £171,545 was about £15,000 more than in the preceding year, but it was considered advisable to maintain the dividend at 10 per cent. and increase the balance carried forward in view of the necessity for providing for exceptional wartime items. He also referred to the distribution of 1 per cent. on the ordinary stock for the special reserve account formed to cover possible depreciation in the company's holding of Government stock. Arrangements had been made to convert this stock into fixed-date securities and so the directors considered the distribution justifiable.

Clarke, Chapman & Co., Ltd., report a net profit for 1942 of £122,239, an increase of £10,623 as compared with the preceding year. As already announced, the ordinary dividend for the year is maintained at 12½ per cent. Depreciation requires £20,876, directors' fees £2,758, reserve £20,000 and staff pensions reserve £10,000. The balance carried forward is £37,754 (against £34,038 brought in).

Bruce Peebles & Co., Ltd., are paying a first and final ordinary dividend of 5 per cent., plus a bonus of 3 per cent., and a participating preference dividend of 2½ per cent., making 10 per cent. for the year (both unchanged).

International Combustion, Ltd., is paying a final ordinary dividend of 15 per cent., plus a bonus of 10 per cent., maintaining the distribution for the year at 30 per cent.

The Midland Counties Electric Supply Co., Ltd. reports that the trading profits, after taxation of the operating companies, for 1942 are £830,730, as compared with £778,018 for 1941, of which £505,399 is appropriated for depreciation and reserves. The net revenue of the holding company, after tax, is £305,835 (against £306,182). The final dividend on the ordinary stock is 5½ per cent., actual, less tax, again making 8 per cent. for the year.

The South London Electric Supply Corporation, Ltd., has announced that, subject to audit, it is proposed to pay an ordinary dividend for 1942 of 7 per cent., less tax. This dividend will be paid in part by drawing upon the reserve available for this purpose. In 1941 an interim dividend of 3 per cent. was paid, followed by a final payment of 4 per cent.

Electrical Distribution of Yorkshire, Ltd., has acquired the whole of the capital (£75,000) of the Settle and District Electricity Co., Ltd., by the issue to the holders of £83,333 of its 6 per cent. cumulative preference stock. The Settle Company was formed in 1931 to take over a Special Order from Crompton Parkinson, Ltd.

The Richmond (Surrey) Electric Light & Power Co., Ltd., is recommending a dividend of 6 per cent., less tax, for 1942 on the ordinary shares. The dividend for 1941 was the same, but was made in two payments of 3 per cent. each.

The Scottish Power Co. is maintaining its ordinary dividend for 1942 at 8 per cent., less tax, by the final payment of 5½ per cent.

The Lancashire Electric Light & Power Co. has decided to pay an ordinary dividend of 5 per cent. for the past year (against 7½ per cent.).

The Llanelly & District Electric Supply Co., Ltd., has raised its ordinary dividend from 5½ per cent. for 1941 to 6 per cent. for the past year.

The North-Eastern Electric Supply Co., Ltd., has announced a final ordinary dividend of 4½ per cent., again making 7 per cent. for the year.

The Newcastle & District Electric Lighting Co., Ltd., has declared a dividend of 7 per cent. in respect of 1942 (same).

The Mid-Cheshire Electricity Supply Co., Ltd., is maintaining its dividend at 8 per cent. for 1942.

The Mersey Railway Co. is paying a dividend of 2⅜ per cent., less tax, on the consolidated ordinary stock for 1942. The dividend for 1941 was 2 per cent.

New Companies

Western Battery & Maintenance Co., Ltd.—Private company. Registered February 16th. Capital, £2,000. Objects: To carry on the business of manufacturers of, and dealers in, accumulators, dry cell and other batteries, wireless goods, electrical fittings, etc. Subscribers: M. A. Yardley, 28, Amhurst Road, E.8, and B. Susman, 77, Green Lane, Edgware, Middlesex. Secretary: M. A. Yardley. Registered office: 57 & 58 Finsbury Court, London, E.C.2.

Guilsfield Electricity Co., Ltd.—Private company. Registered February 17th. Capital, £750. Objects: To acquire the business of

generating and distributing electric current carried on by Thomas C. Purcell at Guilsfield, Montgomeryshire. Directors: T. C. Purcell, P.O., Guilsfield, Montgomeryshire, W. Greatorex, The Moat, Guilsfield and A. E. Richards, H. H. Leslie, Mrs. Susannah M. Webster and Sir Charles G. Trevor, all of Guilsfield. Secretary : T. Lynd Lloyd. Registered office : Church Cottage, Guilsfield, Montgomeryshire.

Radio Publicity, Ltd.—Private company. Registered in Dublin February 10th. Capital, £100. Objects : To carry on, subject to such licences as the company may from time to time be required to obtain from the Minister for Posts and Telegraphs at such places in Eire or elsewhere, as may be determined by the directors of the company, all or any of the businesses of constructing, maintaining or dealing in wireless, electrical, radio and telegraphs, etc. Subscribers : C. Hyland, Ardcairn, Sandyford, Co. Dublin, and J. D. Kiernan, 2, Steampacket Quay, Drogheda, Co. Louth.

Salmic & Co., Ltd. — Private company. Registered February 15th. Capital, £500. Objects : To carry on the business of repairers and maintainers of electrical apparatus, plant and equipment, metal workers, welders, dealers in, and repairers of, wireless and television apparatus, general buying agents and patentees, etc. Subscribers : Olive J. Jaques, 65, Mayfair Avenue, Ilford, Essex, and H. M. Rogers, 7, Hamilton Avenue, Ilford, Essex. Solicitors : S. Rutter & Co., 1 & 2, Great Winchester Street, London, E.C.2.

Companies' Returns

Statements of Capital

Watliff Co., Ltd.—Capital, £21,000 in 3,000 ordinary, 7,000 7½ per cent. preference and 11,000 6 per cent. preference shares of £1 each. Return dated October 5th. All shares taken up. £20,880 paid on 2,880 paid on 2,880 ordinary, 7,000 7½ per cent. preference and 11,000 6 per cent. preference shares. £120 considered as paid on 120 ordinary shares. Mortgages and charges : £9,500.

British Columbia Electric Railway Co., Ltd.—Capital £6,320,000 in £1,440,000 5 per cent. cumulative perpetual preference stock, £1,440,000 preferred ordinary stock, £2,406,103 deferred ordinary stock and £1,033,897 shares unissued. Return dated October 30th. £5,286,103 stock taken up. £5,086,104 15s. paid, including £1 15s. paid in shares forfeited. £200,000 considered as paid. Mortgages and charges : £2,788,170.

Welwyn Garden City Electricity Co., Ltd.—Capital, £150,000 in 100,000 7 per cent. preference shares of £1 and 1,000,000 ordinary shares of 1s. Return dated July 22nd (filed August 22nd). 80,000 preference and 800,000 ordinary shares issued and fully paid up, plus £6,343 3s. 9d. premiums). Mortgages and charges : £40,000.

Park Bros., Ltd.—Capital, £11,000 in 4,000 ordinary, 3,000 7½ per cent. preference and 4,000 6 per cent. preference shares of £1 each. Return dated December 28th. 2,935 ordinary, 3,000 7½ per cent. preference and 3,445 6 per cent. preference shares taken up. £9,114 10s. paid (£1 on 2,581 ordinary, 3,000 7½ per cent. preference and 3,445 6 per cent. preference and 5s. on 354 ordinary shares). Mortgages and charges : £650.

Electric Furnace Co., Ltd.—Capital, £200,000 in 100,000 ordinary and 100,000 preferred ordinary shares of £1. Return dated September 23rd. 78,250 ordinary and 85,500 preferred ordinary shares taken up. £19,750 paid on 6,250 ordinary and 13,500 preferred ordinary shares. £144,000 considered as paid on the remainder. Mortgages and charges : Nil.

Wickford & District Electricity Supply Co., Ltd.—Capital, £30,000 in 1,500 7 per cent. preference and 28,500 ordinary shares of £1. Return dated March 31st (filed October 23rd). 1,500 preference and 16,500 ordinary shares taken up. £17,995 paid. £5 considered as paid. Mortgages and charges : Nil.

Chislehurst Electric Supply Co., Ltd.—Capital, £50,000 in £1 shares. Return dated March 31st (filed October 19th). 40,000 shares taken up. £30,000 paid. £10,000 considered as paid. Mortgages and charges : Nil.

Electrical Resistance Furnace Co., Ltd.—Capital, £5,000 in £1 shares. Return dated September 23rd. All shares taken up. £5,000 paid. Mortgages and charges : Nil.

Rawlings Bros., Ltd.—Capital, £100,000 in 30,000 preference and 70,000 ordinary shares of £1. Return dated September 24th. 21,903 preference and 61,401 ordinary shares taken up. £83,304 paid. Mortgages and charges : Nil.

Increase of Capital

C. E. Reed & Co., Ltd.—The nominal capital has been increased by the addition of £1,000 in £1 ordinary shares beyond the registered capital of £500.

Mortgages and Charges

United Carborundum & Electrite Works, Ltd.—Particulars filed of £5,000 debentures authorised February 3rd, 1943, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Truvox Engineering Co., Ltd.—Satisfaction in full on January 26th, 1943, of series of debentures authorised November 13th, 1941, and registered November 28th, 1941.

Liquidations

Costa Rica Electric Light & Traction Co., Ltd.—Meeting on March 29th pursuant to section 236 (1) of the Companies' Act, 1929, at River Plate House, South Place, London, E.C.2, to receive an account of the winding-up by the liquidator, Mr. R. A. Hamlyn.

Bankruptcies

A. King, wireless and electrical dealer, 6, Beresford Square, Woolwich, S.E.18.—Application for discharge to be heard on March 24th, at the County Court, Scarbrook Road, Croydon Surrey.

F. W. Hodges, electrical engineer, 9A, Station Hill, Kidderminster.—Application for discharge to be heard on April 6th, at the Town Hall, Kidderminster.

STOCKS AND SHARES

TUESDAY EVENING.

STOCK Exchange markets are pursuing the even tenor of their way without attracting a great deal of attention either from investment or speculation. Money is being held back for employment in the various forms of war borrowing which will be prominently brought to public notice, from March 6th onwards, in the "Wings for Victory" period. The Home Railway dividend season being now over, there is little to "go for," as the Stock Exchange says, for another six months, although the yields offered by the junior stocks in this group are sufficiently good to ensure a steady flow of money into them.

Dividend Payments

South London Electric, which passed its interim dividend six months ago, is recommending a dividend of 7 per cent. on its ordinary shares for 1942, the same as that paid for 1941. To meet the dividend, the reserve available for this purpose will be drawn upon. The Richmond (Surrey) Electric Light & Power Co., another of the County of London group, which also passed its interim dividend last September, is to pay 6 per cent. for 1942, the same as for 1941. The Bournemouth & Poole Co. holds a substantial interest in the Richmond Electric Light & Power Co.

When the interim dividends were passed last autumn, it was pointed out here that this did not necessarily preclude the possibility of the previously paid dividends being maintained for the whole of the year. Such consideration had the effect of keeping the prices firm in the face of the non-payment of the interim dividends, and to-day's figures compare not unfavourably with others in the same group. The South London Electric shares are 6d. harder at 26s. 6d. Richmonds remain at 27s.

Transport "C"

One feature in this week's price lists is a further fall in London Passenger Transport "C" stock. Declaration of the dividend, making 3 per cent. for the year, was in accordance with previous anticipation, but this did not prevent a drop of 3 points to 53½. By comparison with the return afforded by some of the other junior stocks in the Home Railway market, the yield on Transport "C" is still small. Holders have pinned their faith hitherto to the belief that, after the war, the Government will implement its agreement to the extent of bringing the stock within sight of a substantially increased dividend. As things are at present, this does not seem to be within sight of being effected for some time to come. It is obvious from the movement in the price that some of the holders have been getting out of their stock, possibly with the intention of replacing it if the price should fall to a lower figure later on.

Indian Industrials

Indian electrical and transport shares which have recently been rising in price, suffered something of a setback by reason of the political complications which it was thought might arise in the event of Mr. Gandhi's fast terminating fatally. Calcutta Electric gave way to 34s. Madras Electric, which had been changing hands as high as 26s., went back to 24s. 6d. Other Indian shares were similarly affected. It may be of interest to mention that Rangoon Electric Tramways ordinary shares, quoted nominally at 10s. to 15s., last changed hands at 28s. 6d. in June, 1941. The company's 6 per cent. preference shares stand at about 10s.; a transaction took place at 15s. three weeks ago. The 4 per cent. first debenture stock last changed hands at 63 in July, 1942.

Fluctuations

For the first time in many weeks, the changes in our price lists show a majority of minus over plus signs. The movements in neither direction are of any large extent save in the case of Transport "C" stock. Some of the gilt-edged descriptions are down by a point: in the speculative groups, Anglo-Argentine Tramways income debenture is 1½ lower at 13½. The tendency amongst equipment and manufacturing shares is easier, British Insulated, for example, having shed 2s. 6d. to 5 7/16 and Callender's reverting to the level £4. Siemens are 1s. 6d. down at 30s. 6d. English Electrics at 47s. 6d. are unchanged on the issue of the report. Other shares in this section have lost a little of their recent strength.

On the other hand, the price of Lancashire Dynamo put on 3s. under buying pressure that found the market poorly supplied with stock. A similar gain lifted Falk Stadelmann to 29s. Mather and Platt advanced to 48s. 9d. General Electrics at 89s. have held their last week's improvement. Sporadic activity in E.M.I. shares left the price 9d. down at 20s. 9d. Cable and Wireless preference and ordinary stocks have lost a point apiece. Canadian Marconis are dull at 6s. 6d. Great Northern Telegraphs have gone back to 23½.

Electricity Supply

Demand persists for the lower-priced shares in the electricity supply department. West Devon, West Gloucester and Llanelly ordinary shares show advances as a result of the inquiries. Electrical Distribution of Yorkshire at 45s. ex dividend are 6d. lower. The company has acquired the £75,000

(*Continued on page* 336)

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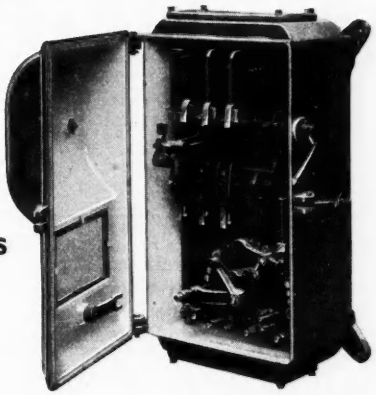

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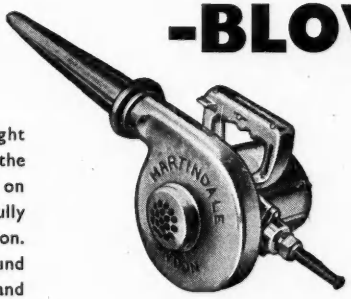

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CIRCUIT BREAKER Design

AND OUR CONTRIBUTION TO PROGRESS

RECENT literature on circuit interruption reflects the steady advance of switchgear design and construction. It records the achievement of still greater interrupting capacities, increased safety of operation, reduced maintenance and greater continuity of service.

The part played in this progress by Elkonite arcing contact materials and their development to meet increasingly severe duty is frequently acknowledged by switchgear designers in papers contributed by them to electrical engineering institutions and journals. We reproduce four references of this kind below.

Such acknowledgments are naturally gratifying to us and we shall hope to continue to contribute our quota to future developments in circuit-breaker design and construction.

"Interrupting contact faces are of Elkonite which is outstanding in its ability to withstand severe and repeated arcing with minimum loss of material."*

"Silver-tungsten (Elkonite) contacts were used for all moving and stationary members to positively prevent welding at 20,000 amperes or more. The use of this alloy reduces the burning of the contact material to a minimum."*

"As in the case of previous tests, the Elkonite-surfaced contacts showed practically no burning."*

"The secondary contacts consist of heavy copper fingers, surfaced on the burning area with a silver-tungsten alloy (Elkonite) to minimise deterioration and prolong the life of the entire stationary contact assembly."*

★ *These short extracts are taken from a detailed bibliography on arcing contacts in circuit-breaker design, giving full abstracts of papers published during the period 1933 to 1942, with particular reference to contact arrangements and materials. A limited number of copies of this bibliography are available, and may be obtained on request by designers and users of circuit-breakers.*

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GD26

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend Previous	Dividend Last	Middle Price Mar. 2	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Companies					
Bournemouth and Poole	12½	12½	61/3	..	4 1 7
British Power and Light	6	6	29/6	..	4 1 4
City of London	7	7	32/6	..	4 6 2
Clyde Valley	8	8	42/–	..	3 16 2
County of London	8	8	42/6	..	3 15 2
Edmundson's:					
7% Pref.	7	7	34/–	..	4 2 4
Ord.	6	6	29/6	..	4 1 4
Elec. Dis. Yorkshire	9	9	45/-xd	–1/–	4 0 0
Elec. Fin. and Securities	12½	12½	51/–	..	4 18 1
Elec. Supply Corporation	10	10	47/–	..	4 5 0
Isle of Thanet	2	Nil	16/–	..	—
Lancs. Light and Power	7½	7½	37/6	..	4 0 0
Llanelly Elec.	5½	6	25/–	+1/–	5 0 0
Lond. Assoc. Electric	4½	4	24/–	..	3 6 8
London Electric	6	6	27/6	+6d.	4 7 3
London Power Red. Deb.	5	5	105½	..	4 14 7
Metropolitan E.S.	8	8	42/–	..	3 16 2
Midland Counties	8	8	41/6	..	3 17 0
Mid. Elec. Power	9	9	44/–	..	4 1 9
Newcastle Elec.	7	7	31/–	..	4 10 5
North Eastern Elec. Ordinary	7	7	34/–	–1,–	4 2 4
7% Pref.	7	7	35/6	+1/–	3 19 0
Northampton	10	10	47/6xd	..	4 4 0
Notting Hill 6% Pref. (£10)	6	Nil	9¼	..	—
Northmet Power:					
Ordinary	7	7	40/–	..	3 10 0
6% Pref.	6	6	32/–	..	3 15 0
Richmond Elec.	6	6	27/–	..	4 9 0
Scottish Power	8	8	41/6	+6d.	3 17 3
Southern Areas	5	5	23/6	..	4 5 0
South London	7	7	26/6	+6d.	5 5 8
West Devon	5	5	23/–	+6d.	4 7 0
West Glos.	4½	3½	22/6	+1/–	3 2 2
Yorkshire Elec.	8	8	42/–	..	3 16 2
Overseas Electricity Companies					
Atlas Elec.	Nil	Nil	5/–	..	—
Calcutta Elec.	7*	7*	34/–	–1/–	—
Cawnpore Elec.	10	10	28/–	..	7 2 10
East African Power	7	7	31/–	..	4 10 4
Jerusalem Elec.	7	5	24/6	+6d.	4 1 8
Kalgoorlie (10/–)	7½	5	9/–	..	5 11 1
Madras Elec.	6*	4*	24/6	..	—
Montreal Power	1½	1½	28½	..	5 5 3
Palestine Elec. "A"	Nil	4*	34/–	+1/6	2 7 3
Perak Hydro-elec.	6	7	9/6	..	—
Shawinigan Power	83cts.	90cts.	19	–½	—
Tokyo Elec. 6%	6	6	18½	..	—
Victoria Falls Power	15	15	78/9	..	3 16 4
Whitehall Inv. Pref.	5	5	23/–	..	—

Company	Dividend Previous	Dividend Last	Middle Price Mar. 2	Rise or Fall	Yield p.c. £ s. d.
Public Boards					
Central Electricity:					
1955–60 Civil Defence)	—	3	100	..	3 0 0
1955–75	5	5	116	..	4 6 2
1951–73	4½	4½	108	..	4 3 4
1963–93	3½	3½	104¼	..	3 7 0
1974–94	3¼	3¼	101	..	3 4 4
London Elec. Trans. Ltd.	2½	2½	96½	..	2 11 10
London & Home Counties 1955–75	4½	4½	110	..	4 1 10
Lond. Pass. Trans.:					
A	4½	4½	121½	–2	3 14 0
B	5	5	120½	–1	4 3 0
C	2⅞	3	53½	–3½	5 12 3
WestMidlands J.E.A. 1948–68	5	5	110	..	4 11 0
Telegraph and Telephone					
Anglo-Am. Tel.:					
Pref.	6	6	113½	..	5 5 9
Def.	1½	1½	29	..	5 3 5
Anglo-Portuguese	8	8	24/–	–1/–	6 13 4
Cable & Wireless:					
5½ Pref.	5½	5½	113	–1	4 17 4
Ord.	4	4	76	–1	5 5 3
Canadian Marconi	$1	Nil	4cts.	6/6	–6d. 2 8 9
Globe Tel. & Tel.:					
Ord.	8¼*	5*	34/6	+6d.	2 18 0
Pref.	6	6	28/6	..	4 4 3
Great Northern Tel.: (£10)	Nil	Nil	23½	–½	—
Inter. Tel. & Tel.	Nil	Nil	8	..	—
Marconi-Marine	7½	7½	32/6	..	4 12 4
Oriental Tel. Ord.	16	10	38/–	..	—
Telephone Props.	6	Nil	14/–	..	—
Tele. Rentals (5/–)	10	10	10/9	–3d.	4 13 0
Traction and Transport					
Anglo Arg. Trans.:					
First Pref. (£5)	Nil	Nil	5/–	..	—
4% Inc.	Nil	Nil	13½	–1½	—
Brit. Elec. Traction:					
Def. Ord.	45	45	1105	..	4 1 6
Pref. Ord.	8	8	170	..	4 14 2
Bristol Trams	8	10	52/–	..	3 17 1
Brazil Traction	$½	$1	23½	+½	—
Calcutta Trams	8	5½	21/6	..	5 2 4
Cape Elec. Trams	5	5	24/6	..	4 3 4
Lancs. Transport	10	10	43/3	..	4 12 4
Mexican Light:					
1st Bonds	5	5	97½	..	5 2 7
Rio 5% Bonds	5	5	105½	..	4 14 9
Souther Rly.:					
5% Prefd.	5	5	75	–1	6 13 4
5% Pref.	5	5	116½	..	4 5 10
T. Tilling	10	10	53/3	..	3 15 1
West Riding	10	10	41/–	..	4 17 7

(*Continued on next page*)

* Dividends are paid free of Income Tax.

Company	Dividend Previous	Dividend Last	Middle Price Mar. 2	Rise or Fall	Yield p.c.
Equipment and Manufacturing					
			£ s. d.		
Aron Elec. Ord.	7½	10	40/–	..	5 0 0
Assoc. Elec. :					
Ord.	10	10	50/6	..	3 19 0
Pref.	8	8	40/–	..	4 0 0
AutomaticTel.&Tel.	12½	12½	56/6	+6d.	4 8 6
Babcock & Wilcox	11	11	50/6	..	4 7 2
British Aluminium	10	10	50/–	..	4 0 0
British Insul. Ord.	20	20	5 1/16	−⅛	3 19 3
British Thermostat (5/–)	18½	18½	17/6	..	5 5 9
British Vac. Cleaner (5/–)	10	15	22/6	..	3 6 9
Brush Ord. (5/–)	Nil	6	7/9	..	3 17 5
Callender's ..	15	15	4	−9d.	3 15 0
ChloridеElec.Storage	15	15	76/3	..	3 18 9
Cole, E. K. (5/–)	7	10	21/3	..	2 7 0
Consolidated Signal	17	24	5¼xd	..	4 11 7
Crabtree (10/–) ..	17½	17½	38/6	..	4 11 0
Crompton Parkinson Ord. (5/–) ..	30	20	26/–	..	3 17 0
E.M.I. (10/–) ..	6	6	20/9	−9d.	2 17 10
Elec. Construction	10	10	42/6	..	4 14 1
Enfield Cable Ord.	12½	12½	58/6	..	4 5 6
Elecl. Switchgear (10/–)	10	10	20/–	..	5 0 0
English Electric ..	10	10	47/6	..	4 4 0
Ensign Lamps(5/–)	25	25	18/9	..	6 13 4
Ericsson Tel.(5/–)	22*	20*	47/6	..	2 2 2
Ever Ready (5/–)	40	40	38/6	..	5 4 0
Falk Stadelmann	7½	7½	29/–	+3/–	5 3 5
Ferranti Pref. ..	7	7	28/9	..	4 17 5
G.E.C. :					
Pref.	6½	6½	38/3	..	3 18 4
Ord.	20	17½	89/–	..	3 18 8
Greenwood & Batley	15	15	36/6	..	8 4 4
HallTelephone(10/–)	10	12½	24/3	..	5 3 2
Henley's (5/–) ..	20	20	25/–	..	4 0 8
4½% Pref. ..	4½	4½	23/–	..	3 18 3
Hopkinsons ..	15	15	58/–	..	5 3 5
India Rubber Pref.	5½	5½	20/–	..	5 10 0
Intl. Combustion	32½	30	6¼	..	4 16 0
Johnson & Phillips	15	15	67/6	..	4 8 9
Lancashire Dynamo	20	20	83/–	+3/–	4 16 5
Laurence,Scott(5/–)	15	12½	10/–	..	6 5 0
London Elec. Wire	7½	7½	30/–	..	5 0 0
Lucas, J.	15	15	72/6	..	4 2 9
Mather & Platt ..	10	10	48/9	+6d.	4 2 2
Met.Elec.CablePref.	5½	5½	21/3	..	5 3 6
Murex	20	20	5¼	−1/16	3 16 2
Pye Deferred (5/–)	25	25	21/3	..	5 17 8
Revo (10/–) ..	20	17½	35/6	..	4 18 7
Reyrolle	12½	12½	65/–	..	3 17 0
Siemens Ord. ..	7½	7½	30/6	−1/6	4 18 4
Smith, S. (1/–) ..	50	37½	9/–	..	4 3 4
Strand Elec. (5/–)	4	7½	7/3	..	5 3 5
Switchgear & Cowans (5/–) ..	15	10	13/6	..	3 14 1
T.C.C. (10/–) ..	5	5	15/–	..	3 6 8
T.C. & M... ..	10	10	47/6	..	3 13 7
Telephone Mfg.(5/–)	9	9	11/6	..	3 18 3
Thorn Elec. (5/–)	20	20	19/3	..	5 4 0
Tube Investments	23½	20	92/6	−6d.	4 6 7
Vactric (5/–) ..	Nil	Nil	11/3	−3d.	—
Vickers (10/–) ..	10	10	19/9	−3d.	5 1 3
Ward & Goldstone (5/–)	20	20	22/–	..	4 11 0
Westinghouse Brake	10	12½	63/6	..	3 18 9
WalsallConduits(4/–)	55	55	42/–	..	5 4 9
West, Allen (5/–)	7½	7½	7/–	..	5 7 2

* Dividends are paid free of Income Tax.

Stocks and Shares (*Continued from page* 334)

capital of the Settle & District Electricity Co., and has paid £83,333 in 6 per cent. preference stock for it. Leave to deal in the latter has been granted by the Stock Exchange Committee. North Eastern ordinary are 1s. down at 34s., but the preference are equally harder at 35s. 6d.

Middle Eastern electrical shares are better by reason, of course, of the more settled conditions now ruling in Egypt and Palestine. Jerusalem Electrics are again 6d. up, and Palestine " A " at 34s. repeat their advance of last week. Hopes are entertained of increased dividends from these companies.

Oriental Telephone

Calculations have been made this week of the value of Oriental Telephone shares now that the holders of the ordinary shares have received £1 return of capital, and the preference have been paid off. The company was formed to operate in India, China, Burma Singapore and Mauritius. The Indian interests have been sold for an amount which comes, approximately, to £1,100,000. Of ordinary shares of £1 each, there are 570,199. issued. Taking the £1,100,000 at its par value, the ordinary shares are worth, it will be seen, 38s., which is about the present market price. This estimate leaves out of account the company's interests in the countries other than India. Under present conditions, these interests may be worth nothing, but it is possible that they may acquire considerable value in the course of time.

Portuguese Nationalisation

Anglo-Portuguese Telephone shares have further receded to 24s., business being done at 23s. 6d. towards the end of last week. Doubt remains as to whether the proposed nationalisation of Portuguese stocks and shares will benefit, or injure, the interests of British proprietors. The uncertainty is responsible for the dullness of these and other Portuguese issues. Diversity of opinion exists as to whether it is worth while holding foreign investments, with the risks that they carry, or whether it is not better to put up with the lower rate of income return obtainable from investment of money in sound domestic securities. In practice, the matter can be settled only by reference to individual circumstances.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

AKTIEBOLAGET Separator.—"An arrangement in and relating to electrical heating of liquid containers of edge filters." 9930/41. June 3rd, 1940. (551123.) "An arrangement in plate heat-exchangers." 9331/41. April 10th, 1940. (551124.) "Arrangement in plate heat-exchangers." 10094/41. August 8th, 1940. (551167.)

P. Alexander.—"Thermal deposition of metals in a vacuum." 11864. September 16th, 1941. (551220.)

Asea Electric, Ltd., and S. Baynes.—"Hoists, cranes, lifts and the like lifting apparatus." 14138. November 3rd, 1941. (551193.)

Automatic Telephone & Electric Co., Ltd., R. Taylor and G. T. Baker.—"Electrical signalling systems." 10146. August 9th, 1941. (551187.)

J. R. Bateman.—"Scales indicating the current in electric welding transformers and in chokes." 11427. September 8th, 1941. (551129.)

British Thomson-Houston Co., Ltd.—"Pressure-operated valves." 13157/41. October 15th, 1940. (551133.) "Indexing devices for punching presses and like machines." 5042/42. April 17th, 1941. (551143.) "Electromagnetic induction apparatus." 16135/41. December 18th, 1940. (551199.)

British Thomson-Houston Co., Ltd., and K. J. R. Cocke. (General Electric Co. in part).—"Valve assemblies for air and gas compressors." 3963. March 25th, 1942. (551275.)

British Thomson-Houston Co., Ltd., and H. Trencham.—"Gas-blast electric circuit-breakers." 12577. September 29th, 1941. (551222.)

M. J. Cradick and Metropolitan-Vickers Electrical Co., Ltd.—"Testing of synthetic-resin-coated bands or sheets." 10194. August 11th, 1941. (551126.)

N. R. Davis and Sun-Vic Controls, Ltd.—"Electric relay devices." 15819. December 8th, 1941. (551233.)

English Electric Co., Ltd., and M. A. B. Landers.—"Temperature-responsive devices." 13685/40. September 30th, 1941. (551177.)

English Electric Co., Ltd., and D. A. Lightband.—"Construction of dynamo-electric machines suitable for use as torque-measuring dynamometers." 12240. September 22nd, 1941. (551130.)

D. J. Evans and E.C.D., Ltd.—"Electrolytic apparatus." 3723/42. November 13th, 1941. (Divided out of 545161.) (551274.)

H. Fletcher.—"Wireless aerial coupling circuits and like tuned circuits." 15222. November 26th, 1941. (551231.)

F. G. Gillard and Plessey Co., Ltd.—"Plug and socket electrical connectors." 10199. August 11th, 1941. (551253.)

A. H. Goggin.—"Control for gyroscopic apparatus." 2652. February 27th, 1941. (551245.)

B. M. Hadfield.—"Selective electrical circuits." 14798. November 18th, 1941. (551228.)

Igranic Electric Co., Ltd.—"Regulating or controlling systems." 9932/41. August 4th, 1940. (551162.)

Johnson, Matthey & Co., Ltd., and J. C. Chaston.—"Hard soldering of copper and copper-base articles." 5090. April 17th, 1942. (Addition to 540961.) (551144.) "Production of joints between steel and silver." 8978. June 30th, 1942. (551174.)

Marconi's Wireless Telegraph Co., Ltd., S. B. Smith and I. S. Forbes.—"Elevated directional aerials or aerial systems." 768. January 12th, 1940. (551243.)

Philips Lamps, Ltd. (Naamlooze Vennootschap Philips' Gloeilampenfabrieken).—"Electric-discharge tubes." 14296. November 5th, 1941. (551226.) "Radio receivers or amplifiers arranged to be fed from direct-current mains." 16012. December 11th, 1941. (551234.)

R. B. Pullin & Co., Ltd., and W. H. Slinn.—"Electrical signalling apparatus." 10886. August 26th, 1941. (551189.)

Pyrotenax, Ltd., and J. G. Lewis.—"Machines for drawing wire tubes and the like." 10182. August 11th, 1941. (551252.)

Radio Gramophone Development Co., Ltd., and H. F. Duffell.—"Carrier current communication system." 15039 and 15040. November 21st, 1941. (551197 and 551230.)

Siemens Bros. & Co., Ltd., and E. A. Forceville.—"Swivel couplings." 16201. December 16th, 1941. (551200.)

Siemens Electric Lamps & Supplies, Ltd., J. N. Aldington and A. J. Meadowcroft.—"Hermetic sealing of metal into vitreous materials." 14676. November 14th, 1941. (551136.)

Standard Telephones & Cables, Ltd. (International Standard Electric Corporation).—"Incandescent electric lamps." 4067. March 27th, 1942. (551142.)

Standard Telephones & Cables, Ltd. (Western Electric Co., Inc.)—"Rectifying contact detector systems for very short electric waves." 1452. February 4th, 1941. (551209.)

Telephone Manufacturing Co., Ltd., and F. S. Pearson. "Manufacture of electrical equipment." 3086/41. April 7th, 1942. (551178.)

Telephone Manufacturing Co., Ltd., G. E. Taylor and T. H. Whale.—"Tumbler switches." 12297. September 23rd, 1941. (551221.)

Westinghouse Electric International Co.—"Calculators for electrical networks." 14521/41. November 13th, 1940. (551194.)

E. Wright.—"Thermally operated electric switches." 11744. September 13th, 1941. (551255.)

Fatality

A verdict of "Death from electrocution by contact with the earth lead from a faulty wireless set" was recorded at an inquest on Mrs. Beatrice Holcombe, aged 32, of Taunton. The borough electrical engineer, giving evidence, said that Mrs. Holcombe must have been particularly susceptible to electric shocks.

Extension of Patents

Court Decisions During 1942

By "Pagent"

NOW that the war has been in progress for more than three years it is time to take stock of the trend of extensions granted under that clause in the Patents and Designs Acts which enables a patentee to ask for a prolongation of the period of his patent to compensate him for loss or damage due to hostilities. In recent years invention has turned more to the immediate necessities raised by the war, but there are many electrical patents that are feeling the effect of the war. It will be interesting to see, therefore, how inventors and patentees are affected by legal judgments during the past year.

First we may consider Mr. Justice Simonds' decision on November 13th, 1942, relating to Sir John Arthur Aiton's letters patent No. 273557 relating to "a new improved method of forming pipe-joints and means therefor" and to a patent of addition thereto No. 291656 for "an improved pipe joint and method of making the same." The main patent and, of course, the patent of addition, were due to expire on November 3rd, 1942. Application was made under Section 18 (6) and (7) of the Patents Acts for an extension of term of both patents. Section 18 (6) enables a patentee to apply for an extension solely on the ground of loss or damage due to the war; subsection (7) limits such extension to a maximum of ten years.

Foreign Patents and Licences

Aiton & Co., Ltd., and Sir John Aiton were registered owners of the above patents which found important application in high-pressure pipe systems in selected power stations. There were corresponding French patents. Stewarts and Lloyds, Ltd., and Vickers Armstrongs, Ltd., were both licensees. The licences did not bring in much, nor did the French patents. The numbers sold rose from 68 in 1927 to 1,782 in 1931 ; dropped to 615 in 1932 ; rose again in 1937 to 3,383 ; and then fell again to 1,100 in 1940 owing to cessation of work on power stations, etc., because of the war.

Most of the sales were under the patent of addition. There was some discussion as to whether the parent patent had really been used. The Judge took a benevolent view of the situation and granted an extension of eighteen months in view of the substantial user and in respect of the loss up to the date of the hearing, but without provision for further loss which might be incurred if the war were prolonged, or which might occur by reason of dislocation and difficulty of exploitation after the war, this having become the established practice.

In June, 1942, Mr. Justice Simonds had already stated in an earlier judgment relating to No. 260905 (Duffy & Firmosic, Ltd.) that when an extension is asked for under Section 18 (6) it is incumbent on the patentee to give such information as he can to the Court with regard to any profits made in respect of foreign letters patents. The reason adduced was that what the patentee might have lost in respect of trade in this country he might have gained by trade abroad where his foreign patent covered him. In this earlier case a prolongation of two years and eight months was granted, leaving it open to the patentee to ask for a further prolongation based either upon a continuance of the war or upon the difficulty of exploiting his patent after hostilities have ceased. The amending Act of 1942 would enable the Court at a later date to measure more accurately what loss the patentee has in fact suffered.

Sales and Overheads

A month earlier, in a Section 18 (6) case (No. 261609—Radiation, Ltd.), where the Judge found that there was a lag between the fall of sales and the fall of the overheads, he re-granted the patent for two and a half years.

Towards the end of 1942 in yet another case, under the same subsection, where receipts under the patent amounted to £4,207 in 1928, to £77,000 in 1937 and fell to £47,000 in 1939, an extension for the full war period, namely three years and two months, was granted without prejudice to further application. His Lordship accepted the argument that the decline was due to apprehension of war and consequent restriction of sales. There would be post-war difficulties in resumption of manufacture.

An application for a grant of extension of term of the Ferguson patent No. 253566 was heard in Northern Ireland. Here the patent was held to have exceptional merit. The grant was reduced, however, because the Court had not sufficiently full information as to the value of certain shares held by the petitioner.

Another judgment of Mr. Justice Simonds will be of special interest to those who are connected with "hush-hush" electrical patents. The case in point concerns the patents of Meredith & Cooke. Although the inventions dealt with gyroscopic control of dirigible objects, the application of the

decision is much wider. The patents were Nos. 365186, 365187, 365189 and 365190. (No. 365188 was not in suit). Briefly, the patents had been assigned to the Crown under Section 30 of the Patents Acts as secret patents. The petitioners were then in the service of the Crown. After six years of Crown use, the patents were re-assigned to the patentees, under an agreement whereby the Crown took 45 per cent. of the proceeds of commercial exploitation. There were corresponding overseas patents in force. An exclusive licence was granted by the patentees to S. Smith & Sons (Motor Accessories), Ltd., under the British patent and the foreign patents were assigned to them.

Ten-year extensions were asked for. The patentees made about £5,000 out of their British patents and a similar sum out of their overseas ones. The licencees suffered a slight loss. It was agreed that the inventions were of exceptional merit and eight years' prolongation was granted in each case.

The following is the substance of the several important rulings given. The Crown need not assess the value to it over a period during which the patents have been assigned to it. Sufficiency of payment offered or made to a Service inventor for his invention will not be considered by the Court when such payment is governed by Treasury Regulations. Assignment to the Crown under Section 30 of the Act cannot be relied on as having deprived the petitioner of a chance of exploiting his patent whilst the assignment is in force. The Court will not review the terms of an agreement between the Crown and an inventor to divide the proceeds of commercial exploitation of a patent if a specific Secretary of State can alter those terms. Service inventors should not be looked upon as occupying worse positions than ordinary employees who have contracted concerning inventions they have made during their employment.

From the above it would appear generally that even in Section 18 (6) cases, merit is a wonderful help towards good extensions ; a shrewd deal in foreign patents may penalise the patentee ; and the Crown may insist on having a substantial share of the proceeds when it releases an invention.

Powder Metallurgy

Mouldings Possessing Special Properties

THE moulding of metal powders, which can frequently be more convenient, or cheaper, than other methods of manipulation, is dealt with in a paper prepared by Dr. W. D. Jones for the NORTH-EAST COAST INSTITUTION OF ENGINEERS AND SHIPBUILDERS.

Press-forming in this way, cold and hot, is claimed to impart properties which cannot be achieved in any other fashion. For instance, porous bronze bearings for electric clocks, refrigerators, vacuum cleaners and other machines that are difficult to lubricate periodically are made by compressing a mixture of copper and tin powders, the compacts so formed being heat-treated in a protective atmosphere. The principle is to carry the hallowed tradition of alloying soft with hard particles to the logical extreme of creating voids in a metal matrix, porosity varying between 25 and 40 per cent. by volume and being susceptible to very exact control in manufacture.

The particle sizes are generally of the order of 250 mesh and a small proportion of powdered graphite or other lubricant may be added to facilitate the pressing operation because metal powders have little ability to flow in a die, which is often of complicated shape; if of considerable depth, it is generally advisable to press from both ends simultaneously.

The compacts rapidly ejected, up to 500 per minute, are firm enough to be handled; they are next sintered by passage through long muffle furnaces, this fritting causing the tin to melt and gradually alloy by diffusion into the copper. Dimensional changes occur during this operation, generally growth but possibly shrinkage, their control being one of the difficulties of manufacture. Nevertheless, one of the greatest advantages of power pressing is that objects can be made exactly to shape and size without machining. After soaking in oil for a few minutes at 110 deg. C., or lower temperature in a vacuum chamber, bearings are finished in a sizing press. The amount of lubricant they will absorb suffices to last for their normal lives, more oil being exuded when the bearings become hot.

Other products of this technique, excluding oil impregnation, include radio-frequency coil and transformer cores, bimetal contact materials, tungsten filaments and " Alnico " magnets, thus avoiding casting defects and expense. Powder metallurgy has several advantages over smelting and casting for consolidating metals in mass, permits composition to be controlled with more precision, often produces purer metal, allows grain size and shape to be controlled and is beginning to reduce expenditure on power and labour.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia.—COMMONWEALTH.—P.M.G.'s Department. March 23rd. Resistances and reactances (Sch. C.4008).

March 30th. Testing instruments, exchange service type (Sch. C.4036).

April 1st. Testing instruments, insulation and resistance testers (Sch. C.4035).

April 8th. Jacks (Sch. C.4016).

(See February 5th for other items.)

Brighouse.—March 17th. Electricity Committee. Supply and delivery of one 300-kVA transformer and switchgear. (See this issue.)

Plymouth.—March 20th. Electricity Supply Department. One suspension electromagnet and auxiliary apparatus and two three-phase inter-star neutral earthing compensators. (See this issue.)

Orders Placed

London. — STOKE NEWINGTON. — Electricity Sub-committee. Accepted. Oil purification and testing apparatus for use in connection with oil switches and transformers (£199).—Streamline Filters, Ltd.

West Bromwich. — Electricity Committee. Accepted. Street lighting equipment.—Wardle Engineering Co., Ltd.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Alnwick.—Farm workers' houses; R.D.C. surveyor.

Ashington.—British Restaurant, High Street; B. Preston, surveyor, U.D.C. offices, Ashington.

Aylesbury.—Houses (14) for agricultural workers; R. C. White, architect, Brooke House.

Brighouse.—Rebuilding after fire; G. Turner & Sons, Ltd.

Adaptation of chapel for educational purposes (£5,400); H. A. Sneezum, borough surveyor, Commercial Street.

Electrical installation at hospital; borough surveyor.

Coulsdon.—Nursery, Grange Park (£2,529); H. C. Plater.

Darlington.—Works additions; Wrightson & Co., Ltd., contractors, Stockton-on-Tees.

Derbyshire.—Additional school accommodation, Sutton-cum-Duckmanton; J. Harrison, county architect, St. Mary's Gate, Derby.

Gateshead - on - Tyne. — Factory extensions, North Eastern Trading Estate; Hetherington & Wilson, County Chambers, Westgate Road, Newcastle-on-Tyne.

Canteen and workshops, North Eastern Trading Estate; Stanley Miller, 17, North Street, Newcastle-on-Tyne.

Gosforth.—Miners' canteen; T. A. Page, Son & Bradbury, 75, King Street, South Shields.

Hampshire.—Youth centre, Lee-on-Solent (£1,318); county architect, Winchester.

Jarrow.—Blacksmith's shop, Mercantile Dry Dock Co., Ltd.; D. Glen, Back Queen's Road.

Works extensions; Bewley & Scott, builders, Dunston-on-Tyne.

Prefabricated hut to be equipped as a central kitchen (£1,500); J. S. Weir, borough engineer, Town Hall.

Wartime nursery; borough engineer.

Kidderminster.—Reconstruction of church schools; Rev. W. Sterry-Cooper, Elmbridge Vicarage, Cutnall Green.

London. — ST. MARYLEBONE. — Nursery, Devonshire Street (£1,600); borough engineer.

Manchester.—Restoration of Royal Exchange; Bradshaw, Cass & Hope, architects, 19, Silverwell Street, Bolton.

Nursery, Beswick; G. Noel Hill, city architect, Albert Square.

Newcastle-on-Tyne.—Decontamination centres in Rhodes Street and Whitworth Street; R. G. Roberts, city architect, 18, Cloth Market.

School shelters and school kitchen; Sowerbys (Contractors) Ltd., 1, Framlington Place.

School shelters; John Craven & Son, 227, Two Ball Lonnen.

Laboratories and drawing offices; Hetherington & Wilson, County Chambers, Westgate Road.

Northallerton.—Houses (14) for R.D.C.; T. G. Easdale, surveyor, Crosby Road.

Oldham.—British Restaurant, Fletcher Street; G. C. Hardy, borough surveyor, 75, Union Street.

Oxford.—Training centre for mechanics; W. A. Daft, architect, 6a, Cornmarket Street.

Patricroft.—Works extensions; J. Cockyer, Ltd., building contractors, Station Saw Mills, Walkden, near Manchester.

Salisbury and Wilton.—Houses (12) for agricultural workers; surveyor, R.D.C. offices, Salisbury.

Southall.—Hutted nursery, Jubilee Park; J. B. Thomson, borough engineer.

Southgate.—Workshops, Green Lanes; Auto (C. Walkley), Ltd.

Belt works, Green Lanes; Thos. Baxenden, Ltd.

Stokesley (Yorks).—Farm workers' houses (12); R.D.C. surveyor.

Stratford-on-Avon.—Houses (15) for R.D.C.; H. J. Weekes, surveyor, 11, Guild Street.

Withernsea.—Erection of building for British Restaurant; C. G. J. Ratcliff, surveyor, Municipal Buildings.

Worcester.—Offices for Severn Catchment Board; A. Barton, engineer to the Board, Sansome Walk.